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THE CLOUDBERRY.

I WONDER whether I need begin by telling the English reader that Mount Washington is the highest peak of the White Mountain range in New Hampshire, and practically the most elevated summit along the entire Atlantic slope of America, its only rival in this respect being some remote and inland Carolinian hills, unknown to fame and unvisited by the gregarious Transatlantic tourist? We had a splendid day for our easy ascent by the steep little railway on the Rigi pattern, with middle cog-wheel and oblique engine, which puffs and toils up the abrupt gradients; and when we reached the top, though the clouds were swirling and wreathing around us, the view was magnificent, and the morning clear as heart could wish it. As soon as we had drunk our fill of the prospect, however, we turned of course to our more proper and professional task of botanising; and the very first plant that attracted my attention, wedged in among the crannies of the huge boulders that strew the summit, as chance would have it, was an overblown cloudberry. I took it up and gazed at the northern herb with a certain fond and reverent attention, for it was the first cloudberry I had ever seen in the living state, though I knew its form and features well enough already from frequent illustrations, and from herbarium specimens. But it was quite another thing to pick that curious Arctic plant here among its own chilly native surroundings, and to recognise in it a last lingering relic of the glacial epoch on the top of Mount Washington.

Of course you remember the pictures of the cloudberry in all the books of Arctic exploration. There is a very good one in Nordenskiöld's "Voyage of the *Vega*," for the cloudberry is the great stand-by of the Polar voyager as a fresh fruit and preservative against scurvy. No other edible berry grows so far north among the ice and snow; no other can so readily be obtained by northern sailors in their last port as this dwarf representative of the bramble genus. But besides its importance as an article of food in high latitudes, the cloudberry has a deep scientific interest as well as a typical specimen of the glacial flora which came in with the approach of the Great Ice Age. No other herb could more admirably illustrate from a certain side the striking traits of the Arctic vegetation, and the peculiar way in which it has been modified in order to meet the needs of a chilly climate.

The cloudberry, indeed, is a true circumpolar type of plant, found in turfy bogs, tundras, and peat mosses, all round the Arctic circle, in Europe, Asia, and America alike. In the extreme north—in Siberia, Finland, Norway, and British North America—it is a lowland plant, inhabiting the wide water-logged plains with which those subarctic lands are so thickly covered. But as it ranges southward it clings rather to the upland bogs, the wet places on the mountain sides, and the moist crannies of the rocks and boulders that strew their summits. Generally a high northern herb, it descends towards the summer sun in Europe along the Baltic shore into the heart of Germany; and it occurs abundantly among the combes and hollows of the Scotch Highlands, as well as less frequently in the wet moorlands of Yorkshire, Donegal, and even North Wales. I might easily, therefore, have seen the cloudberry on our own side of the Atlantic, had I been there to look for it, without taking the trouble of going to America to hunt it up; but it takes a lifetime for a man to make personal acquaintance with all the plants even of our limited little British flora in their native haunts; and, as a matter of fact, I had never before seen a cloudberry "all a-growing and a-blowing," as the costermongers say, till I picked it that day on the summit of Mount Washington. And, indeed, I was not sorry that I should have caught my first glimpse of this Arctic strayling in such a sublime and congenial situation.

And now, at last, what *is* the cloudberry? It is a little, green, herbaceous bramble, with no woody stem, no trailing branches, no stout armour of defensive prickles—a mere succulent herb, low and inconspicuous, seldom rising more than three or four inches above the frostbound ground—in short, a blackberry bush reduced by cold to the abject condition of a wild strawberry vine. Like many other Arctic and mountain plants, its rootstock creeps under ground, so as to avoid being frozen during the chill winters of its chosen habitat; and here and there it sends up short herbaceous stems, wholly unarmed, and bearing at best only two or three round or kidney-shaped leaves, somewhat toothed at the edge, and often cut into from five to nine broad lobes or divisions. The flowers are large and white, as so frequently happens with northern or upland plants, and they are far prettier and more conspicuous than our English raspberry or blackberry blossoms, so as to attract the short-lived northern butterflies, by whose aid the blossoms are probably always fertilised. Self-fertilisation, indeed, is efficiently guarded against in this instance by the flowers having become specialised each to a single sex. One plant will bear, however, blossoms with stamens only, and no pistil or fruit; another will have fertile flowers with pistils only, and no stamens to supply them with pollen. In this way the benefits of cross-fertilisation are rendered obligatory, so that insect visits become a matter of prime necessity to the existence of the plant. The fruit, when ripe, is rather large, of the raspberry type, but consisting of a few big grains only. In fine, it is a delicate amber colour, or sometimes almost orange-red; and the flavour, though agreeably acid, is pleasant and tasty. Altogether, a distinct boon to the northern traveller, this inconspicuous reduced little bramble.

In origin, the cloudberry must be regarded as a Polar plant of the period immediately preceding the Great Ice Age; and it owes its development to the immense though gradual lowering of the Arctic temperature which preceded that long, slow, secular cataclysm. The bramble genus, to which the cloudberry belongs, falls naturally into two main groups, the blackberries and the raspberries, as we call them in the vernacular, from the two representatives best known in actual practice to non-botanical British humanity. The great distinguishing mark between them lies not in the colour (for some American blackberries are bright red, if I may be forgiven so obvious a bull, while the common black raspberry of the Northern States looks a good deal blacker than the English blackberry itself), but in the way in which the fruit behaves when separated from the "hull," "hank,"

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or receptacle. With the true raspberries, as everybody knows, the fruit comes off entire like a thimble, leaving a hollow in the centre where the hull used to be. In the true blackberries, on the other hand, the fruit adheres tightly to the hull, which has to be broken off and eaten with it. Of these two types, the cloudberry belongs to the first or raspberry group, as do also our common red raspberries, the American black raspberry, the purple-flowering raspberry, and the Nutka bramble of our shrubberies and gardens. The English blackberries and dewberries, on the other hand, as well as the numerous American black and red blackberries, belong rather to the second or true bramble class.

The brambles must already have existed abundantly in the world long before the Glacial Epoch, because we find several representatives of both groups in Europe and America, some of them nearly identical on both sides of the Atlantic, and others widely different in character and aspect. They were then already bushy plants, armed for the most part with stout prickles, and divided into many of their existing species, though a few have since diverged independently, such as the wild red raspberry of America, which, though closely resembling our European type, is now adjudged to be specifically distinct in certain minor technical peculiarities. Time has sufficed to work the change under diverse conditions. But there could be as yet no cloudberries, because there were as yet none of the Arctic or snowy-mountain conditions under which alone the cloudberry flourishes. The herbaceous brambles are all northern and cold-weather species, and they could not possibly have come into existence before the Glacial Epoch made the proper habitats of such species possible. If you look into such a book as Professor Babington's "Manual of British Botany" (written without regard to evolutionary principles) you will find the main division of the brambles made into—A. Shrubby, and B. Herbaceous brambles; the raspberry and blackberry being classed under the first, and the cloudberry and stone-bramble under the second heading. But a moment's consideration will show you that this is not a point of classificatory or hereditary importance at all: it is a mere point of adaptive modification. The real division of the ancestral type, long before the Glacial Epoch, during the warm Pliocene or Miocene times, was the one I have given above, into "thimbleberries" and "stickberries;" and the modern Arctic cloudberries, and so forth, are mere stunted and herbaceous developments of the original raspberry or thimbleberry group. Any one who will take the trouble to look at the distribution of the species at the present day will see that this must be so.

We have in England a plant which shows in a less degree the peculiar dwarfing effect of the Glacial Epoch on the bramble type; I mean the little stone-bramble of the northern shires, whose creeping rootstock sends out a few unobtrusive runners and almost herbaceous stems, which rise, however, far higher than those of the cloudberry, often to as much as a foot from the ground. These stems are slender and downy, and armed with a few soft prickles, the last dwindling abortive representatives of the brambly hooks of our hedge blackberry. Now the stone-bramble is clearly a dwarfed form, which has felt the effect of the northern winter, but has been less deeply impressed by its dwindling effects than the cloudberry itself. It is, in fact, a somewhat more southern though upland type, diffused over all the mountain regions of Europe and Central Asia, and not by any means so distinctly circumpolar as the more decidedly herbaceous forms. Similarly, in America they have a little plant, the dwarf raspberry, which I found abundantly among the valleys of the White Mountain range, whose stems are annual, low, herbaceous, and devoid of prickles, but with three leaflets to each stalk, instead of a simple leaf like the cloudberry's, and with a blossom more like that of the garden raspberry. This intermediate form descends as far south as Pennsylvania, and has not felt the glacial dwarfing nearly so much as the far northern species.

For fear of misapprehension, I ought distinctly to add that I do not consider any of these half-herbaceous raspberries as really halfway houses between the cloudberry and its original Pliocene ancestor. They are rather independent species, which have undergone to a less extent the same sort of dwarfing from the same cold-weather causes. Just in like manner the Glacial Epoch developed the tiny northern herbaceous willow out of the tree-like willows of Pliocene times; and it turned the birch into that queer little, stunted, span-high form which we still find in Arctic climates, and whose relics occur in the glacial leaf-beds. The immediate ancestor of the cloudberry, indeed, must have been a bushy raspberry answering closely in type to the Nutka bramble, which, though shrubby, has no prickles, and agrees with the cloudberry in its simple leaves and large white flowers, as well as in the broad flat form of its depressed fruit. Indeed, the cloudberry still bears on its very face one mark of having ultimately descended from such an ancestor, because, though it now produces only two or three leaves on each stem, the base of the stem is covered with a mass of empty stipules (or winged leaf-stalks, to talk popularly), which recall the memory of a time when the stem was much taller than now, and produced an immense number of leaves. The botanical reader will know what I mean when I say that the internodes between these stipules remain undeveloped in consequence of the great dwarfing of the stem and suppression of the accompanying leaves. The stipules themselves, in short, are the outward and visible sign of the derivation of the cloudberry from a once much larger and taller bramble.

The Arctic raspberry, on the other hand, said (though no doubt erroneously) to have been gathered on the Isle of Mull, and common in high latitudes in Europe, is a dwarfed herbaceous descendant of a pink-flowered species with three leaflets to each leaf, akin in all probability to the dwarf raspberry of the Northern States. In short, when the Glacial Epoch came on, it reduced to Arctic scrubbiness all the plants that could accommodate themselves to the altered circumstances; and hence the dwarf herbaceous habit is really no test of descent or relationship at all, but a mere result of the chilly conditions under which the species now live.

One word as to the occurrence of the cloudberry on the summit of Mount Washington at the present day. During the period of the greatest glacial extension this little plant, with hundreds of other Arctic species, was driven down far into the central lowlands of America, where they all flourished together until the ice began to retreat again. When the glacial sheet retired northward, however, the Arctic plants retired with it; but a few of them were left, above the limit of trees, on the chilly tops of the White Mountains. That is almost the only station for the cloudberry in the United States; but in the extreme north—at Lubeck, in Maine—it reappears upon the sea-coast, and thence it extends through frozen Nova Scotia, and still more frozen Labrador, till it reaches at length the Arctic circle. Like a living fossil, it recalls to us still on these wind-swept New Hampshire heights the long secular winter of the glacial period.

THE STORY OF CREATION.

A PLAIN ACCOUNT OF EVOLUTION.

BY EDWARD CLODD.

PART II.—EXPLANATORY.

CHAPTER I.

It must be so, for miracles are ceased;
And therefore we must needs admit the means
How things are perfected.

ARCHBISHOP OF CANTERBURY:
Henry V., act i., scene 2.

The gases gather to the solid firmament; the chemic lump arrives at the plant and grows; arrives at the quadruped and walks; arrives at the man and thinks.—EMERSON.

IN the second paper of this series a summary account was given of the materials which make up the Universe.* These were comprised under the terms Matter and Power. Power is that which acts upon Matter in the production or destruction, the increase or decrease of motion; and, as explained already, it is upon this two-fold and opposite action that we base our assumptions as to the nature of Matter—*i.e.* as consisting of atoms of infinite minuteness.

That form of Power which draws the atoms together into larger or smaller masses, and which resists their separation, we call Force; that form of Power which drives the atoms apart and resists their combination, we call Energy. Both Force and Energy are, like Matter, indestructible; in other words, the sum-total of each is a fixed quantity. Force inheres in, and cannot be taken from, each atom of weighable matter; but Energy passes from atom to atom and from mass to mass, its vehicle being that unweighable ethereal medium which is supposed to fill the spaces between bodies and between the particles of bodies. In this diverse way each is ceaselessly acting: Force aggregating the particles round various centres, Energy separating them and passing into space, only fractions of it striking intervening bodies, as, *e.g.*, in the interception of the sun's radiant energy by the planets. And the certain result, however immeasurably distant, is that all the Energy of the Universe will be dissipated, and that all the Matter of the Universe will become cold, solid, and inert under the aggregating and unopposed action of Force.

The problem we have now to consider is this:—Given Matter and Power as the raw materials of the Universe; is the interaction of Power, under its two forms of a combining Force and a separating Energy, upon Matter, sufficient to account for the totality of non-living and living contents of the Universe?

Of the beginning, of what was before the present state of things, of what will follow the end of it, we know nothing, and speculation about it is futile. Science is concerned with the Universe as we find it, the mobile vehicle of orderly succession; the Evolved, or Unfolded; *das Werden*, as the Germans say, or the Becoming; not less full of endless significance because the questions of its origin and destiny are without answer; not less wrapped in mystery as to its ultimate nature because we describe it as a mechanical process, and do not fall back upon unknown agencies or assume unknown attributes of Matter or Power to explain it.

But since everything points to the finite duration of the material universe—for what it now is it once was not, and its state is ever changing—we must make a start somewhere. And we are therefore compelled to posit a primordial nebulous, non-luminous state, when the atoms, with their inherent forces and energies, stood apart from one another in momentary pause. Not evenly distributed, else Force would have drawn them together as an uniform spherical mass round a common centre of gravity, and Energy, awakened by the collision of atom with atom, would have passed profitlessly in the form of heat to the ethereal medium; but varying in position and character, with special gravitation towards special centres. This theory of unstableness and unlikeness at the outset squares with the unequal distribution of Matter, with the movements of its masses in different directions and at different rates, and with the ceaseless redistribution of Matter and Power. All changes of state are due to the rearrangement of atoms through the play of attracting forces and repelling energies, resulting in the evolution of the seeming like into the actual unlike, of the shapeless into the shapely, of the simple into the more and more complex, till the highest complexity is reached in the development of living matter. If all that is, from fire-fused rock to the genius of man, was wrapped up in primordial matter, with its forces and energies, we can speak of simplicity only in a relative sense as contrasted with the infinite variety around us which has been evolved.

Inorganic Evolution.—Under this head we may apply the foregoing to the earliest stages of cosmical change, to the *Evolution of Stellar Systems.*

The existence of nebulous or cloud-like objects in space, which the telescope, aided by the analysis of the spectroscope, proves to be immense masses of glowing gas, together with other evidence to be duly cited in its place, justifies the assumption of a yet more discrete state of the atoms which formed the material universe at the outset. But, although we are familiar with matter in an invisible state, as, *e.g.*, in the element oxygen, which, in a combined state, forms nearly half the solid framework of the globe, we can form no conception of the extreme rarefaction of the primitive atoms. Upon this Helmholtz remarks that "if we calculate the density of the mass of our planetary system at the time when it was a nebulous sphere which reached to the path of the outermost planet, we should find that it would require several millions of cubic miles of such matter to weigh a single grain." Given, however, the play of Force and Energy upon this diffused matter, the mechanics of the process which resulted in the visible universe are not difficult of explanation. The Force bound up in each atom, acting as affinity, combined the atoms as molecules; acting as cohesion, it united the molecules into masses; acting as gravitation, it drew the masses toward their several centres of gravity. One of these masses, by no means the largest, became the nucleus of our solar system, which may be taken as a type of all other masses whose evolution into stellar systems is as yet complete.

As the atoms rushed together, Energy, which had hitherto existed in a state of rest as passive separation, became active in *molar* and *molecular* form. As *molar* energy it imparted motion to each mass, a motion of rotation on its own axis; and a motion in an orbit, as in the proper motion of double stars, and of the planets round the sun. As *molecular* energy it imparted a rapid vibratory backwards and forwards motion to the molecules, which motion was forthwith converted into the radiant energy of heat and light, rendering the mass self-luminous. From the moment of their conversion the dissipation of both forms of energy ensued. The friction of the ethereal medium slowly retards the orbital motion of every mass, the molar energy thus lost passing into that medium, until finally the movement in the orbit will be stopped, and the force of gravitation, no longer resisted by energy, will draw the smaller masses to the larger, as vagrant meteors are being ceaselessly drawn to planets

* KNOWLEDGE, December 1885, p. 41. The reader will find the present explanation easier to follow if he will read the whole of chap. ii. in Part I. again.

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and sun. Moons will gravitate to their planets, planets to their suns, and so on, until the matter of the universe, with intermediate outbursts of energy, becomes cold, inert, and solid, and Force will have subdued all things unto itself. The molecular energy likewise passes, but more rapidly, into the ethereal medium, throbbing ceaselessly in all directions to the farthest marge of space, if any marge there be. Small portions of it are intercepted by each mass, but of these the larger proportion is reflected back, the remainder setting up separative motions on the surface, as, *e.g.*, in the familiar case of the action of the sun's radiant heat on the earth. Of this solar energy, which is radiated equally in every direction, the earth does not intercept much more than the two thousand millionth part. And of this the larger proportion is reflected back, only a fraction, to be itself finally dissipated, being used to maintain the earth as the theatre of changes whose highest result is life.

Such, with much detail left out for clearer presentment of the subject, is the mode in which the shining hosts of stellar systems, as the sand by the sea-shore innumerable, appear to have been evolved from nebulous matter. In this exposition students of astronomy will recognise the "nebular theory" of Kant and Laplace, but with important modifications due to the doctrine of the Conservation of Energy, which was unknown in their day.*

Evolution of the Solar System.—We may now leave the general for the particular, and apply the theory to the evolution of the stellar system to which we belong, and to that portion of it which we call our earth. If the explanation of the origin of the sun and planets repeats somewhat of the foregoing, it will only bring home to us the uniformity of the process, and show that what is true of the whole holds good for every part, and for the parts of every part down to the indivisible and unseen atoms of which all things consist.

Two striking pieces of evidence of the common origin of the sun and planets may be cited at the outset:—(1) They are made of like materials; (2) they have like motions.

1. The spectroscope has revealed to us the chemical constitution of several of the fixed stars, their enormous distance not affecting the trustworthiness of the analysis. It evidences to the existence of substances in the glowing vapours of their atmospheres akin to those which feed the fires of the sun; and if such identity of stuff is proved to exist between the sun and other stars, we may with reason look for still closer identities of material between him and his family of planets, moons, and erratic bodies.

2. The planets and, with rare exceptions, their satellites, revolve round him in the same direction; they also, so far as is known, rotate on their axes in the same direction, and very nearly coincide in the shape and planes of their orbits, which are almost in a plane with the sun's equator. Now, since the consequences would be the same were these motions, both on axis and in orbit, in the reverse direction, the inference is obvious that there was an uniform motion of rotation of the mass from which they were severally formed.

As with the primitive nebula from which that mass was detached, so with the mass itself; there were differences of density throughout. On no other theory is its segregation into a multitude of bodies explicable. As the rotation of the mass quickened with the indrawing of the particles towards the common centre of gravity, the energy of molar separation acted most powerfully in the region of the bulging equator, and, overcoming the force of cohesion along the line of least resistance, detached certain portions one after another at irregular intervals from the central mass as it retreated within itself. These portions were the nuclei of the planetary groups, in which the like processes of contraction and rupture were repeated, the masses detached becoming moons, or, as in the case of Saturn, rings of satellites. In respect of the diffused and highly energised fugitive masses, as comets and meteors, Mr. Proctor has adduced cogent reasons in support of the theory that they are "products of expulsion from suns, from giant planets, and from orbs like our earth when in the sun-like state."

The origin of the planets and their moons being found in the mode described above, it is obvious that in their primitive state they were molten, and shone by their own light. The smaller the body, the sooner would its molecular energy be dissipated; in other words, the quicker it lost its heat. The present in a large degree interprets the past, and explains the several stages of the members of our system, according to their bulk. The sun, whose mass exceeds the combined mass of all the planets more than 700 times, is still slowly contracting, and therefore still radiating energy. The cloud-laden atmospheres of the larger planets, as Jupiter and Saturn, are torn by cyclones only second to those of the sun in their fury, and the molten centres feed volcanic outbursts to which those of Vesuvius and Krakatoa are squibs. But as for the smaller bodies, their turmoil is calmed and their light extinguished; the store of energy is exhausted; the forces of affinity and cohesion have gained the upper hand and drawn the particles together into the solid form. Thus it is with the moon, on whose dead and barren surface we may read the future of the giant planets and the sun himself. For the history of one is the history of all; each has passed, or is passing, from the indefinite nebulous state, through numberless modifications, to the definite and solid state; by decrease in volume and increase in density. What the earth is, the moon was; what the moon is, the earth will be.

Evolution of the Earth.—To this passage from the sun-like to the solid state the earth bears witness. Its flattened poles, its bulging equator, its spheroidal shape, are the effects of rotation on a fluid or viscous mass; whilst the geologically oldest parts of the crust—for there is no primogeniture in matter—are of a structure which is producible only by the fusion of particles under intense heat. As that crust, thin and mobile at the outset, continued to cool and thicken, it evidenced more strikingly to the play of forces and energies within and of energies, and, in lesser degree, of forces without. The cooling and shrinking of the internal mass, as the stored-up energy slipped away, caused tension of the crust, which, yielding to the force of gravitation, was drawn inwards, and cracked and crumpled into mountains and valleys, and into the deep depressions which the great oceans have filled since the time when their waters were first condensed from the thick primitive vapours that swathed the cooling earth. Then the continuous action of the sun's radiant energy, operating through air and water upon the increasingly rigid crust, dissolved its superficial particles, and re-deposited them as stratified rocks, in endless beauty and variety, over the surface of the globe. And herein lies the major cause of our earth's present condition as a possible abode of life. For its native supply of energy—that of position derived from the momentum given it when thrown off from the parent mass; and the still unspent, but always lessening, store of internal heat manifest in the volcano and the earthquake—would not suffice to arrest effeteness and the wrapping of the globe in a winding-sheet of ice. It is the imported supply from the sun which alone does that, for in its absence the trivial tidal energy due to the moon would

* For a lucid criticism of the defects of Laplace's theory, more especially in its failure to account for the peculiar distribution of the larger and smaller planets, the reader may study with advantage Mr. Proctor's essay on "How the Planets Grew" in his "Expanse of Heaven."

be futile, because the seas and oceans would be solid. Opposing the force which attracts everything into inert union, the solar energy sets up the separative motions, the ceaseless redistributions, which give rise to the grand climatal and vital phenomena of nature. Expanding the air, it causes the inrush to which winds and storms are due; heating the water, it excites the warm currents and draws heavenward the aqueous vapour, which, driven by the wind, returns, when its energy is lost, as rain and snow, those silent yet mightiest agents of mechanical, chemical, and vital changes. But the full significance of the work done by the sunbeams that strike the earth's surface will appear when we treat of the relation of the living to the not-living.

MARTINGALES;

OR, SURE (?) GAMBLING SYSTEMS.

IN previous pages I have considered, under the head of "Gamblers' Fallacies," certain plans by which some fondly imagine that fortune may be forced. I have shown how illusory the schemes really are which at first view appear so promising. There are other plans the fallacy in which cannot be quite so readily seen, though in reality unmistakable, when once the conditions of the problem are duly considered.

Let me in the first place briefly run through the reasoning relating to one of the simpler methods already considered at length.

The simplest method for winning constantly at any such game as *rouge et noir* is as follows:—The player stakes the sum which he desires to win, say 1*l*. Either he wins or loses. If he wins he again stakes 1*l*., having already gained one. If, however, he loses, he stakes 2*l*. If this time he wins, he gains a balance of 1*l*., and begins again, staking 1*l*., having already won 1*l*. If, however, he loses the stake of 2*l*., or 3*l*. in all (for 1*l*. was lost at the first trial), he stakes 4*l*. If he wins at this third trial, he is 1*l*. to the good, and begins again, staking 1*l*. after having already won 1*l*. If, however, he loses, he stakes 8*l*. It will readily be seen that by going on in this way the player always wins 1*l*. when at last the right colour appears. He then, in every case, puts by the 1*l*. gained and begins again.

It seems then at first as though all the player has to do is to keep on patiently in this way, starting always with some small sum which he desires to win at each trial, doubling the stake after each loss, when he pockets the amount of his first stake and begins again. At each trial the same sum seems certainly to be gained, for he cannot go on losing for ever. So that he may keep on adding pound to pound, *ad infinitum*, or until the "bank" tires of the losing game.

The fallacy consists in the assumption that he cannot always lose. It is true that theoretically a time must always come when the right colour wins. But the player has to keep on doubling his stake practically, not theoretically; and the right colour may not appear till his pockets are cleared. Theoretically, too, it is certain that be the sum at his command ever so large, and the stake the bank allows ever so great, the player will be ruined at last at this game, if—which is always the case—the sum at the command of the bank is very much larger. It would be so even if the bank allowed itself no advantage in the game, whereas we know that there is a certain seemingly small, but in reality decisive, advantage in favour of the bank at every trial. Apart from this, however, the longest pocket is bound to win in the long run at the game of speculation which I have described. For, though it seems a tolerably sure game, it is in reality purely speculative. At every trial there is an enormous probability in favour of the player winning a certain insignificant sum; but, *per contra*, there is a certain small probability that he will lose, not a small sum, or even a large sum, but all that he possesses—supposing, that is, that he continues the game with steady courage up to that final doubling which closes his gambling career, and also supposing that the bank allows the doubling to continue far enough; if the bank does not, then the last sum staked within the bank limit is the amount lost by the player, and, though he may not be absolutely ruined, he loses at one fell swoop a sum very much larger than that insignificant amount which is all he can win at each trial.

Although this gambling superstition has misled many, yet after all it is easily shown to be a fallacy. It is too simple to mislead any reasonable person long. And indeed, when it has been tried, we find that the unfortunate victim of the delusion very soon wakes to the fact that his stakes increase dangerously fast. When it comes to the fifth or sixth doubling, he is apt to lose heart, fearing that the luck which has gone against him five times in succession may go against him five times more, which would mean that the stake already multiplied 32 times would be increased, not 32 times, but 32 times 32 times, or 1,024 times, which would either mean ruin or a sudden foreclosure on the bank's part and the collapse of the system.

For the benefit of those who too readily see through a simple scheme such as this, gamblers have invented other devices for their own or others' destruction, devices in which the fallacy underlying all such plans is so carefully hidden that it cannot very readily be detected.

The following is a martingale (as gamblers call these devices for preventing fortune from rearing against them) which has misled many:—

The gambler* first decides on the amount which he is to win at each venture—if that can be called a venture which according to his scheme is to be regarded as an absolute certainty. Let us say that the sum to be won is 10*l*. He divides this up into any convenient number of parts, say three; and say that the three sums making up 10*l*. are 3*l*., 3*l*., and 4*l*. Then he prepares a card on the annexed plan (fig. 1), where W stands for winnings, L for losses, and M (for martingale) heads the working column which guides the gambler in his successive ventures.

W	M	L
	£3	
	3	
	4	

FIG. 1.

The first part of the play is light and fanciful: the player—whom we will call A—stakes any small sums he pleases until he loses, making no account of any winnings which may precede his first loss. This first loss starts his actual operations. Say the first loss amounts to 2*l*.: A enters this sum in the third column (see fig. 2) as a loss, and also in the second under the cross-line. He then stakes the sum of this number, 2, which is now the lowest in column M, and 3, the uppermost—that is, he stakes 5*l*. If he loses, he enters the lost 5*l*. in columns M and L; and next stakes 8*l*., the sum of the top and bottom figures (3*l*. and 5*l*.) in column M. He goes on thus till he wins, when he enters under the head W the amount he has won, and scores out in column M the top and bottom figures—viz., the 3*l*. (at the top), and the last loss (at the bottom). This process is to be continued, the last stake, if it be lost, being always scored at the bottom of column M, as well as in the loss column, the last win being always followed by the scoring out of the top and

* The account of the system here considered appeared in the *Cornhill Magazine* under the heading "A San Carlo Superstition," and was in that place described as "a pretty little martingale" recently submitted to me by a correspondent of KNOWLEDGE.

bottom remaining numbers in column M. When this process has continued until all the numbers in column M are scored out, A will be found to have won 10*l.*; and whatever the sum he had set himself to win in the first instance, so long as it lies well within the tolerably wide limits allowed by the bank, A will always win just this sum in each operation.

Let us take a few illustrative cases, for in these matters an abstract description can never be so clear as the account of some actual case.

Consider, then, the accompanying account by A of one of these little operations. The amount which A sets out to win is, as before, 10*l.* He divides this up into three parts—3*l.*, 3*l.*, and 4*l.* He starts with a loss of 2*l.*, which he sets in columns M and L. He stakes next 5*l.* and loses, setting down 5*l.* in columns M and L. He stakes 8*l.*, the sum of the top and bottom numbers in column M, and wins. He therefore sets 8*l.* under W, and scores out 3*l.* and 5*l.*, the top and bottom numbers in column M. (The reader should here score out these numbers in pencil.) The top and bottom numbers now remaining are 3*l.* and 2*l.* Therefore A stakes now 5*l.* Say he loses. He therefore sets down 5*l.* both in column M and column L, and stakes 8*l.*, the sum of the top and bottom numbers under M. Say he loses again. He, therefore, puts down 8*l.* under columns M and L, and stakes 11*l.*, the sum of the top and bottom numbers under M. Say he wins. He puts down 11*l.* under W, and scores out the 3*l.* left at the top and the 8*l.* left at the bottom of the column under M. (This the reader should do in pencil.) He then stakes 9*l.*, the sum of the top and bottom numbers (4*l.* and 5*l.* respectively) left under M. Say he wins again. He then puts down 9*l.* under W, and scores out the 4*l.* left at the top and the 5*l.* left at the bottom of the column under M. There now remains only one number under M, namely, 2*l.*, and therefore A stakes 2*l.* Let us suppose that he loses. He puts down 2*l.* under M and L, and, following the simple rule, stakes 4*l.* Say he wins. He then puts down 4*l.* under W, and scores out 2*l.* and 2*l.*, the only two remaining numbers under M. A, therefore, now closes his little account, finding himself the winner of 8*l.*, 11*l.*, 9*l.*, and 4*l.*, or 32*l.* in all, and the loser of 2*l.*, 5*l.*, 5*l.*, 8*l.*, and 2*l.*, or 22*l.* in all, the balance in his favour being 10*l.*, the sum he set forth to win.

W	M	L
	£3	
	3	
	4	
	2	£2
	5	5
£8	5	5
11	8	8
9	2	2
4		
£32		£22

Fig. 2.

It seems obvious that the repetition of such a process as this, any convenient number of times at each sitting, must result in putting into A's pocket a considerable number of the sums of money dealt with at each trial. In fact, it seems at a first view that here is a means of obtaining untold wealth, or at least of ruining any number of gambling banks.

Again, at a first view, this method seems in all respects an immense improvement on the simpler one. For whereas in the latter only a small sum can be gained at each trial, while the sum staked increases after each failure in geometrical progression, in this second method (though it is equally a gambling superstition) a large sum may be gained at each trial, and the stakes only increase in arithmetical progression in each series of failures.

The comparison between the two plans comes out best when we take the sum to be won undivided, when also the system is simpler; and, further, the fallacy which underlies this, like *every* system for gaining money with certainty, is more readily detected, when we consider it thus.

Take, then, the sum of 10*l.*, and suppose 5*l.* the first loss, after which take two losses, one gain, one loss, and two gains. The table will be drawn up then as shown—with the balance of 10*l.*, according to the fatal success of this system.

W	M	L
	£10	
	5	£5
	15	15
	25	25
£35	20	20
25		
15		
£75		£65

On the other hand, take the other and simpler method, where we double the original stake after each failure. Then supposing the losses and gains to follow in the same succession as in the case just considered, note that the first gain closes the cycle. The table has the following simple form (counting three losses to begin with):—

W	L
	£10
	20
£80	40
£80	£70

We see then at once the advantage in the simpler plan which counterbalances the chief disadvantage mentioned above. This disadvantage, the rapid increase of the sum staked, is undoubtedly serious; but, on the other hand, there is the important advantage that at the first success the sum originally staked is won; whereas, according to the other plan, every failure puts a step between the player and final success. It can readily be shown that this disadvantage in the less simple plan just balances the disadvantage in the simpler plan.

But now let us more particularly consider the probabilities for and against the player involved in the plan we are dealing with.

Note in the first place that the player works down the column under M from the top and bottom, taking off two figures at each success, and each figure adding one figure at the bottom after each failure. To get then the number of figures scored out we must double the number of successes; to get the number added we take simply the number of failures, and the total number of sums under M is therefore the original number set under M, increased by the number of failures. He will therefore wipe out, as it were, the whole column, so soon as twice the number of successes either equals or exceeds by one the number of failures (including the first which starts the cycle). Manifestly the former sum will equal the latter, when the last win removes two numbers under M, and will exceed the latter by one when the last win removes only one number under M.

Underlying, then, the belief that this method is a certain way of increasing the gambler's store, there is the assumption that in the long run twice the number of successes will equal the number of failures, together with the number of sums originally placed under M, or with this number increased by unity. And this belief is sound; for according to the doctrine of probabilities, the number of successes—if the chances are originally equal—will in the long run differ from the number of failures by a number which, though it may perchance be great in itself, will certainly be very small compared with the total number of trials. So that twice the number of successes will differ very little relatively from *twice* the number of failures, when both numbers are large; and all that is required for our gambler's success is that twice the number of successes should equal *once* the number of failures, together with a *small* number, viz. the number of sums originally set under M, or this number increased by unity. So that we may say the gambler is practically certain to win in the long run in any given trial.

In this respect the method we are now considering resembles the gambling superstition before examined. In that case also the gambler is sure to win in the long run, as

he requires but a single success to wipe out the losses resulting from any number of failures. He is in that case sure to succeed very much sooner (on the average of a great number of trials) than in the latter.

But we remember that even in that case where success seems so assured, and where success in the long run—*granting the long run*—is absolutely certain, the system steadily followed out means not success but ruin. No matter what the limit which the bank rules may assign to the increase of the stakes, so long as there *is* a limit, and so long as the bank has a practically limitless control of money as compared with the player, he must eventually lose all that he possesses.

Hence we cannot assume that, because the method we are considering insures success in the long run, the gambler can win to any extent when the long run is not assured to him. Here lies the fallacy in this, as in all other methods, of binding fortune to the gambler's wheel. The player finds that he must win in the long run, and he never stops to inquire what run is actually allowed him. It may be a short run, or a fair run, or even a tolerably long run; but the question for him is, will it be long enough? And note that it is not only the limitation which the bank may assign to the stakes which we have to consider: the gambler's possessions assign a limit, even though the bank may assign none.

Let us see, then, what prospect there is that in this, as in the other case, a run of bad luck may ruin the player—or rather, let us see whether it be the case that in this, as in the other system, patient perseverance in the system may not mean certain ruin, which ruin may indeed arrive at the very beginning of the confident gambler's career.

Instead of all but certainty of success in each single trial which exists in the simpler case, there is in the case we are considering but a high degree of probability. It is very much more likely than not that in a given trial the gambler will clear the stake which he has set himself to win. (This is why we so often hear strong expressions of faith in these systems: again and again we are told with open-mouthed expressions of wonder that a system of this sort must be infallible, because, says the narrator, I saw it tried over and over again, and always with success.) Granted that it is so; indeed, it would be a poor system which did not give the gambler an excellent chance of winning a small stake, in return for the risk, by no means evanescent, that he may lose a very large one.

Observe, now, how the chances for and against are balanced between the two systems. Suppose such a run of ill-luck as in the simpler system would mean absolute defeat, because of the rapid increase (by doubling) of the sum staked by the gambler. Say, for instance, a bank allows no stake to exceed 1,000*l.*, so that ten doublings of a stake of 1*l.*, raising the stake to 1,024*l.*, would compel the gambler to stop, and leave him with all his accumulated losses, amounting to 1,023*l.* Now, take the case of a gambler trying the other system for a gain of 10*l.*, divided into three sums, 3*l.*, 3*l.*, and 4*l.* under column M, and suppose that after winning a number of times he unfortunately starts ten defeats in succession, his first loss having been 3*l.*; then his second loss was 6*l.*; the third, 9*l.*; the fourth, 12*l.*, and so on; the tenth being 30*l.* His total loss up to this point amounts only to 165*l.*, and is, therefore, much less serious than his loss would have been had he begun by staking 1*l.*, and doubled that sum nine times, losing ten times in all. Moreover, his next stake, according to the system, is only 33*l.*, which is well within the supposed limit of the bank. But on the other hand, to carry on the system, he now has to go on until he has cleared off all the thirteen sums in the column under M. To do this he has to run the risk of several further runs of ill-luck against him, and it is by no means necessary that these should be long runs of luck for the score against him to become very heavy indeed. Be it noticed that at every win he scores off only a small portion of the balance against him, while every run of luck against him adds to that score heavily. And notice, moreover, that while on this system he does not quickly approach the limit which the bank may assign to stakes, he much more quickly encroaches on his own capital—a circumstance which is quite as seriously opposed to his chance of eventual success as the finality of the bank limit. So far as the carrying out of his system is concerned, it matters little whether he is obliged to stop the play on the system because his pockets are emptied, or because the bank will not allow him further to increase his stake.

Similar remarks apply to the following method, which has recently been suggested by another correspondent of KNOWLEDGE as an improved system:—

"My improvements," he writes, "consisted, 1st, in arranging that two players should play in concert, one staking persistently upon one colour while the other staked upon the other. A run of ill luck to one would then be somewhat counterbalanced by the run of good luck to the other, while sometimes both would seem to be winners.

"2nd, in staking the *sum* of the extreme figures in the guide-column only when the number of figures in it was even; when they were odd, *e.g.*,

1
2
3
4
5

only the highest, 5, is staked. Thus the rise of the stakes is considerably reduced, while the principle of the play is still carried out.

"3rd, in splitting up a game when a run of ill luck has occurred into two or more games, and winning these *seriatim*. Suppose, for instance, that the chances of the game have brought the guide-column into the form given in the margin. The player has actually lost 30, and must win 36 to gain 6. He might stake 36, but this would be rash. He should play more cautiously, and convert the column into 3 new columns, totalling 12 each, or even into 4, totalling 9,

−1	
−2	
−3	
3	
−4	
−4	
6	
6	
−9	
12	

	1		
	2		1
3 of	2	or 4 of	2
	3		3
	4		3
Total	12	Total	9

FIG. 3.

The numerals with a *minus* sign are supposed to be struck out.

and play out three or four encounters with the guidance of these columns. If luck makes the securing of success in these a long affair, his partner is meanwhile reaping the benefit of a run upon his colour.

"I believe that, allowing the bank its small advantage, the chance of winning 5 events out of 12, 6 out of 15, &c., is large. But, of course, the possible gain is small compared with the possible loss; and here, I have no doubt, the plan breaks down."

The plan is only safer than the others in the sense that it prolongs the agony. The introduction of two partners does not affect the validity of the system one way or the other: for the chances of each must be considered separately, though their gains or losses are afterwards to be divided. The only point to be considered in that respect is the idea that the bad effects for one partner of a run on a colour would be corrected by the good effects for the other. As a matter of fact, there would be no such compensation. A run on one colour which would set one of the partners two or three hundred pounds to the bad, would perhaps gain for the other forty or fifty pounds at the outside. Then it must be remembered that we not only have to consider the actual loss when an unfavourable colour appears, but its effect on the operation of the system. During an unfavourable run the stakes are rising and the distance to be covered before

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(if ever) safety is reached is increasing. By the suggested improvements the rate of increase in the stakes is undoubtedly diminished, but the rate at which the desired goal is approached is diminished in equivalent degree. I scarcely recommend any one to test any of these systems experimentally, even though without any idea of putting them into actual practice. It is easy enough to apply such a test by tossing a coin or cutting a pack a sufficient number of times. For, as the essential principle of all such systems is that they depend on the improbability of an event whose occurrence—when it does happen—will involve a heavy loss—a loss more than cancelling all preceding gains—it is naturally likely that any moderately long series of trials will seem to favour the theory, the fatal run not chancing to show in a series of trials too short to give it a fair chance of showing.

It has been thus indeed that many foolish folk have been tempted to trust in a system which has brought them to their ruin. Consider what an irony underlies the gambler's faith in such systems. When he starts with the hope of winning, say, 10*l.*, he is perhaps to some degree doubtful; but he goes on until perhaps he is at such a stage that if he stopped he would be the loser of fifty or sixty pounds. Yet such is his confidence in his system that, although at this stage he is in a very much worse position than at the beginning, the mere circumstance that he is working out a system encourages him to persevere. And so he continues until the time comes—as with due patience and perseverance it inevitably must—when either the bank limit is reached or his pockets are emptied. In one case he has to begin again with a deficit against him much larger than any gain he has probably made before; in the second he has the pleasant satisfaction of noting, perhaps, that if he had been able to go on a little longer, fortune would (from his point of view) have changed. Though as a matter of fact, whether he had had a few hundreds of pounds more or not only affects his fortunes in putting off a little longer the inevitable day when the system fails and he is ruined.

We may compare the trust in a system to such trust as a bettor on races might put in laying long odds—when the odds are really long, but not quite so long as those he offers. Supposing a bettor to lay odds of 30 to 1 in sovereigns systematically, when the true odds are 25 to 1, he will probably win his sovereign on the average twenty-five times in twenty-six trials, but the 30*l.* he will have to pay in the twenty-sixth case (on the average) will leave him 5*l.* to the bad on that set of trials, excellent though his chance of success may appear at each separate trial.

In fine, the moths who seek to gain wealth rapidly and safely by gambling methods and systems are attracted almost equally by two equally delusive flames. They either trust in their own good luck, as in buying lottery tickets, backing the favourite, or the like, hoping to win large sums for small sums risked (these small sums, however, being always in excess of the just value of the chance); or they trust in the bad luck of others, as when they try delusive martingales (though they never see what they are really doing in such cases), or when they lay long odds (always longer than the just odds), hoping to win many small sums at small risk of losing large ones; or they combine both methods. Inevitably, in the long run, they lose more in many small sums than they get back in a few large ones; and they lose more in a few large sums than they get back in many small ones. They lose all round, yet they delude themselves all round into the belief that they are wise.

INDIAN MYTHS ABOUT THUNDER.

By "Stella Occidens."

THE almost universal belief prevails among the North American Indians that thunder is a great bird. The Dacotahs explain in this way the velocity with which thunderstorms travel. A large bird starts the rumbling, and a number of smaller birds keep it up; hence the long duration of the peals. The Indians say that the young birds, or thunders, do the mischief, and are like the young men, who will not listen to the words of wisdom. The old thunder, or bird, does not kill anybody, nor do any kind of mischief.*

The Dacotahs show a place near the source of the St. Peter's, called Thunder-tracks, where the footprints of the thunder-bird are seen in the rocks twenty-five miles apart.† The great thunder-bird is actually supposed to have been shot in Dacotah, and the exact spot is shown.

Mrs. Eastman says that there is no end to the fancies entertained by the Sioux concerning thunder. They believe a thunder-storm to be a struggle between Unk-ta-he, the god of waters, and Wauhkeon, the thunder-bird, for the command of their nation. The following story was related by one of the oldest men in this tribe, who was revered as a medicine man of great powers:—"Unk-ta-he is as powerful as the thunder-bird Waukheon. Each wants to be the greatest god of the Dacotahs, and they have had many battles. My father was a great medicine man; he was killed many years ago, and his spirit wandered about the earth. The thunder-bird wanted him, and Unk-ta-he wanted him, for they said he would make a wonderful medicine man. Some of the sons of Unk-ta-he fought against the sons of the thunder-bird. The young thunder-birds were killed, and then Unk-ta-he took the spirit of my father to teach him many mysterious things."‡

The Dacotah tribes likewise believed in a giant, named Haokah. This being possesses superhuman powers. He dresses in many colours, and wears horns, or a forked hat, to represent the lightning. With his hands he takes the thunder and hurls it to the ground. His face is red on one side and blue on the other, and his eyes are of different colours. He always carries a bow and arrow in his hand, but never uses them, "as one look will kill any animal he wants." His manifestations were fourfold, and one of the four winds was the drumstick he used to produce the thunder.§

The Chipeways represent thunder brandishing a rattlesnake, the symbol of the electric flash, and sometimes they call him the north-west wind, which usually brings the thunderstorm in the region they inhabit.‖ Thunder brandishing a rattlesnake recalls a Passamaquoddy myth, which relates how Glooskap changed "certain saucy Indians into Rattlesnakes because they yelled at the thunder. Long time ago the Rattlesnakes were Indians. They were very saucy. They had too much face. They could not be put down by much, and they got up for very little. When the great Flood was coming Glooskap told them about it. They said they did not care. He told them the water would come over their heads. They said that would be very wet. He told them to be good, and pray. Then those Indians hurrahed. He said, 'A great Flood is coming.' Then they gave three cheers for the great Flood. He said,

* Tylor, "Primitive Culture," vol. i., p. 363.
† Eastman, "Legends of the Sioux," p. 71.
‡ Eastman, "Legends of the Sioux," p. 161.
§ Brinton, "Myths of the New World," p. 164. Eastman, "Legends of the Sioux," p. 158.
‖ Brinton, "Myths of the New World," p. 182.

'The Flood will come and drown you all.' Then these Indians hurrahed again, and got their rattles and rattled them, and had a grand dance. The rain began to fall, and they danced. The thunder roared, and they shook their rattles and yelled at it. Then Glooskap was angry. He did not drown them in the Flood, however, but he changed them into Rattlesnakes. Nowadays, when they see a man coming, they lift up their heads and move them about. That's the way snakes dance. And they shake their rattles in their tails, just as Indians shake their rattles when they dance." *

Among the Canadian Indians the dark storm-cloud is supposed to be a great bird, and the lightnings are regarded as writhing worms or serpents in its beak. These fiery serpents are believed in to this day, and the thunder is their hissing.† These serpents are also referred to among the Algonkin traditions. Michabo had a great conflict with the shining prince of serpents, who lives in the lake, and floods the earth with its waters. He destroyed him with a dart, and, clothing himself with the skin of his foe, he drove the rest of the serpents to the south, "where in that latitude the lightnings are last seen in the autumn." The Iroquois also tell of a great horned serpent "which rose out of the lake and devoured the people," until a hero destroyed it with a thunderbolt.‡

Michabo not only overcame the prince of serpents, but likewise became master of the thunder and lightning, and with these he destroys his enemies. This again bears a strong resemblance to an Iroquois myth, about their thunder god, Heno. He rides through the heavens on the clouds, and hurls thunderbolts at his enemies, often splitting great forest trees, and making vast chasms in the earth with his mighty weapons. He gathers the clouds, pours out the warm rains, and is chosen as patron of industry, invoked at seed-time and harvest, and called grandfather by his children the Indians.§

Some tribes believe that thunder is the voice of the Great Spirit of the four winds speaking from the clouds, telling them that the time of corn-planting is near.‖

The Mississippi Indians believe that the first man ascended into heaven, and thunders there.¶ The following Passamaquoddy myth relates the story of a man who became a "thunder" for a while, but returned to earth after an absence of seven years. The Passamaquoddies believe that the rumble of the thunderstorm and the flashes of lightning are the demonstrations of thunder-spirits, who are playing ball and shooting their arrows in the heavens.** One day a Passamaquoddy Indian wished to become "a thunder." All at once his companions saw him mounting to the sky in the smoke of the camp fire. He was taken up to the abode of the thunders, placed in a long box, and by some mysterious process invested with the properties and existence of a thunder spirit; or, as Louis Mitchell puts it, he was "thunderfied." He lived for seven years among the thunders, played ball with them in the sky, shot his gleaming arrows with them at the bird they are always chasing toward the South, married a female thunder-spirit, and pursued an active and contented life of thunder and lightning. Seven years after his translation a violent storm passed over the encampment of the Passamaquoddies; there was an unusual and frightful contention among the thunder spirits; the rumbles were more terrible than Passamaquoddy had ever heard before; the air smelled of brimstone; the sky blazed with red and yellow flames; the clouds opened, and great forks of fire shot out of them; the rain fell in sheets; peal answered peal; one tongue of lightning spat out fire to another. The Passamaquoddies, who never had beheld such a storm, believed that the legions of the thunder-spirits were waging their most awful war. They fell down and crossed themselves. In the midst of their alarm they saw a human form slide down into their camp on a beam of light. It was their old friend, who had made his escape from pursuing thunders, shaken off his "thunderfied" existence, and returned to them. He had changed somewhat, but all his old friends knew him. On this point, at least, he was more fortunate than poor Rip Van Winkle, whose story, in some respects, resembles the above. The legend quaintly concludes with the words, "He lived with his tribe till he died."*

This myth agrees almost word for word with a legend found in the manuscript of Louis Mitchell. These "thunders," however, had wings. The chief would give them orders when to put them on, and always warned them not to go too low, for "it is sure death for them to be caught in the crotch of a tree." The roar and crash of the thunder is the sound of their wings, and their great amusement is to play ball across the sky. When they return they carefully put away their wings for their next flight. Leland considers that this legend is unquestionably of Eskimo origin, or common to the Eskimo; also, because it speaks of thunders as always endeavouring to kill a great bird in the south. This is probably the thunder, or storm-bird, called by the Passamaquoddies *Wochowsen*, that is, Wind-Blower. Another legend makes Thunder and Lightning the sons of Mount Katahdin.†

With regard to the Wind-Blower, the following tale is told by the Passamaquoddies:—"The Indians believe that this bird lives far in the north, and sits upon a great rock at the end of the sky;‡ and it is because whenever he moves his wings the wind blows, they of old times called him that. When Glooskap was among men, he often went out in his canoe with bow and arrows to kill sea-fowl. At one time it was every day very windy; it grew worse; at last it blew a tempest, and he could not go out at all. Then he said, 'Wuchowsen, the Great Bird, has done this!' He went to find him; it was long ere he reached his abode. He found, sitting on a high rock, a large white bird. 'Grandfather,' said Glooskap, 'you take no compassion on your *Koosesek*, your grandchildren. You have caused this wind and storm; it is too much. Be easier with your wings!'

'The Giant Bird replied: 'I have been here since ancient times; in the earliest days, ere aught else spoke, I first moved my wings; mine was the first voice, and I will ever move my wings as I will.' Then Glooskap rose in his might; he rose to the clouds; he took the Great Giant Bird Wuchowsen as though he were a duck, and tied both his wings, and threw him down into a chasm between deep rocks, and left him lying there. The Indians could now go

* Leland, "Algonkin Legends," p. iii.
† Fiske, "Myths and Myth-makers," p. 51.
‡ Brinton, "Myths of the New World," p. 122.
§ Tylor, "Prim. Cult.," Vol. II., p. 305.
‖ Schoolcraft, "Indian Tribes," i., p. 319.
¶ Tylor, "Prim. Cult.," Vol. II., p. 312.
** In North Germany, the peasants still say of thunder that the angels are playing skittles aloft; and of the snow, that they are shaking the feather beds in heaven. Baring-Gould's "Book of Werewolves," p. 172. [In Brittany, the same idea of skittles or bowling games going on in heaven prevails: "The gods are playing at bowls" the servants tell the children when it thunders.—R. P.]

* Extract from *The Lewiston Journal*, and reprinted in *New York Tribune* for September 30, 1886.
† "Algonquin Legends of New England." Leland, p. 265.
‡ Compare this with the account of Hroesvelgr, the name of a giant referred to in the Edda. "In the shape of an eagle he sits at the end of heaven; from his wings cometh all wind upon men. He sits at the north side of heaven, and when he flaps his wings, the winds flap from under them." The Hindus also believe that tempests come from Garuda's wings. "Somadeva," 22, 102: the motion of his flight stirs the wind. Grimm's "Teutonic Mythology," Vol. II., p. 633.

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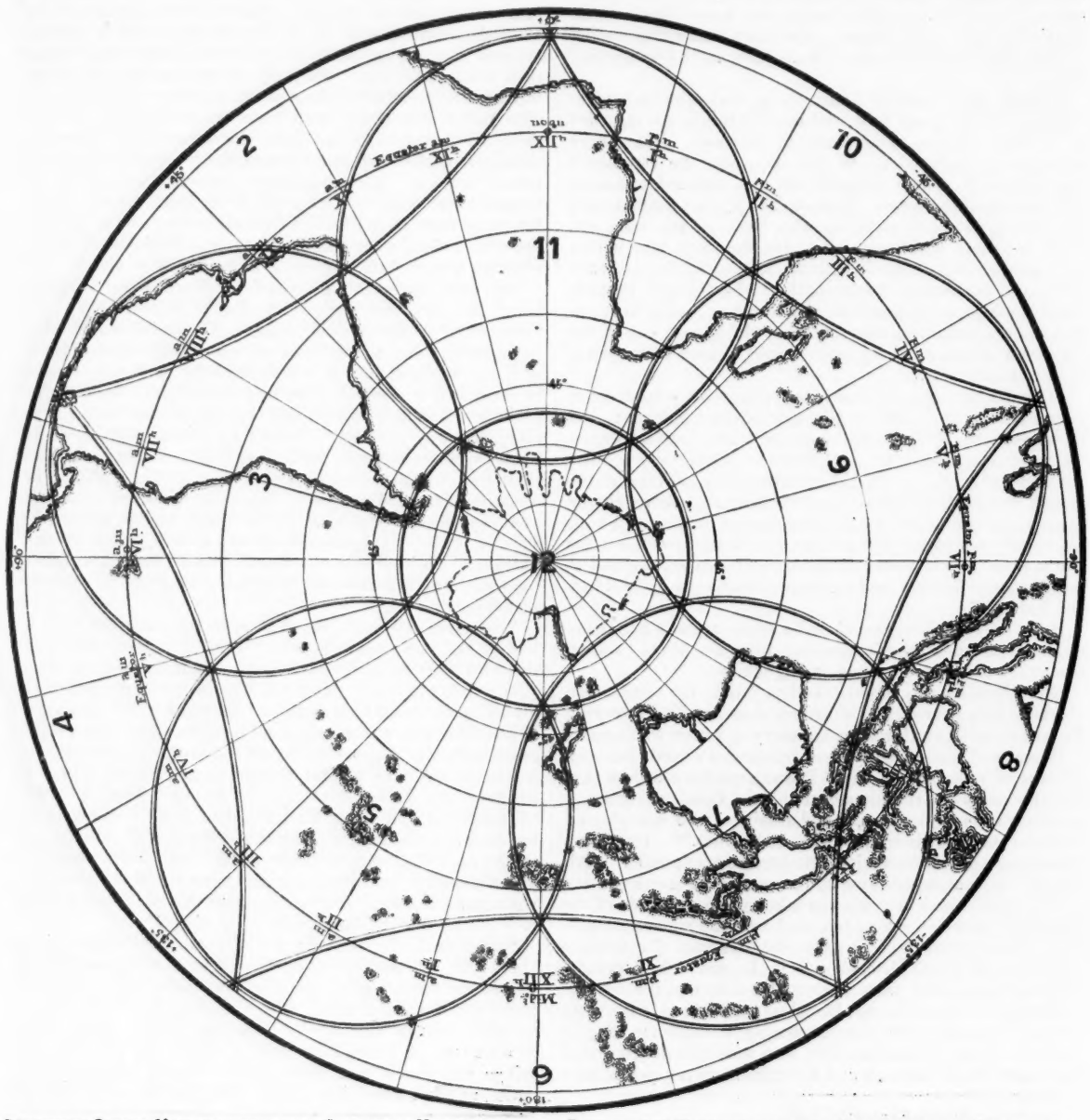
out in their canoes all day long, for there was a dead calm for many weeks and months. And with that all the waters became stagnant. They were so thick that Glooskap could not paddle his own canoe. Then he thought of the Great Bird, and went to see him. As he had left him he found him, for this bird is immortal. So, raising him, he put him on his rock again, and untied one of his wings. Since then the winds have never been as terrible as in the old time."

This story is also from the original, and found in the manuscript of Louis Mitchell (an Indian member of the Legislature of Maine, whose researches are of great interest). The main incidents of this story are repeated in Tumilkoontaoo, the Broken Wing, from the Micmoc, but there is no mention of Glooskap.*

Glooskap, as the greatest magician, subdues the Giant of the North, the terrible god of the storm. The winds must have been terrible in those olden times if the winds of the present day have only half the strength of former storms.



Southern Index Map, showing the Southern Hemisphere, and Part of the Northern on the Stereographic Projection.

A ONE-SCALE ATLAS.

THIS month we give the southern index map, which, with the northern map on the same plan, given last month, presents the whole sphere, and as divided for the purpose of the one-scale atlas, the maps of which are now in hand.

* "Algonquin Legends." Leland, p. iii.

THE SOUTHERN SKIES.

DECEMBER, JANUARY, AND FEBRUARY.

THERE are few features of a journey south more interesting than the change by which night after night new stars are brought into view. Low down towards the southern horizon constellations unknown in our northern heavens are seen hour by hour, night after night. As the stout ship ploughs her way onwards the star groups already seen creep gradually higher in the southern skies, fresh groups taking their place along the southward verge of the star canopy. The stars which had been overhead at home pass downwards towards the north; the stars which had been high in the southern skies pass overhead, and are seen northwards; and the stars which had been high towards the north sink lower, or pass beneath the northern horizon. But changes such as these attract less notice than the changes towards the south, because they bring no new stars into view, whereas not a clear night comes in any voyage towards the south but stars never seen in our latitudes can be recognised low down in that direction. It is as when we climb a rounded hill, seeing at each step new features beyond its outline, only that though we are rounding a globe surface in travelling we cannot be said to *climb*, seeing that our distance from the centre remains unchanged save for the oblateness of the earth's spheroidal globe.

It has seemed to me well (the idea occurred long after this work was well entered on) to use these southern maps to illustrate the change of the heavens towards the south in southward travelling, as well as to show (which was their primary purpose) the aspect of the southern heavens, month by month and hour by hour, in southern latitudes. Thus these maps may serve as companions for travellers from northern to southern regions, enabling them, at whatever time their journey may take place, to recognise the new stars rising steadily above the southern horizon as they themselves advance steadily southwards.

Suppose, for instance, that the traveller is on his way south from the latitude of the middle of the British Isles, in the month of February. The map of the southern skies in the present number of KNOWLEDGE presents in its upper half the southern half of the heavens as seen at the hours named underneath the map, in England and Wales, Scotland and Ireland, or in any part of the northern hemisphere in the same latitudes. Of course this is only absolutely true for one exact latitude, viz., 52° north, but it is quite near enough for ordinary study of the star-strewn heavens between latitudes 45° and 60° north. The point marked Z, which, as the map is intended to be used in the southern hemisphere, represents the north point of the horizon, is the zenith, or point overhead, for the northern use of the map I am now considering. The point E is on the horizon due east, the point W is on the horizon due west—in both uses of the map; but whereas for the southern use E O W represents a semicircle passing from east at E overhead at O to west at W, in the northern use it represents the horizon from east at E to due south at O and to west at W.

In England, then, we have at the time and hours named under the map, *Orion* at his highest nearly due south. Almost overhead is the night star *Capella*, α of the Constellation *Auriga*. Along the horizon we have *Hydra* in the south-east, a great vacant region all around, a part of the poop of *Argo*, *Canis* the Greater Dog, *Columba* the Dove, *Eridanus* the Great River, and the upper half of the body of *Cetus* the Sea Monster.*

Travelling southwards, it is the stars below O in our map which at the times named below the map are coming gradually into view. More and more of *Argo* rises above the horizon somewhat to the east of the south point, more and more of *Eridanus* towards the south-west. The south point of the horizon advances along the south pole of the heavens as the traveller advances towards the south, and at a rate varying precisely as his does, for the plan of the projection is such that equal distances on the star sphere are represented by equal distances along all diameters of the map. The varying southern horizon is not shown in the maps, but can easily be pictured as an arc (not far from circular) running from E to W through the south point of the horizon, advancing southwards as described.

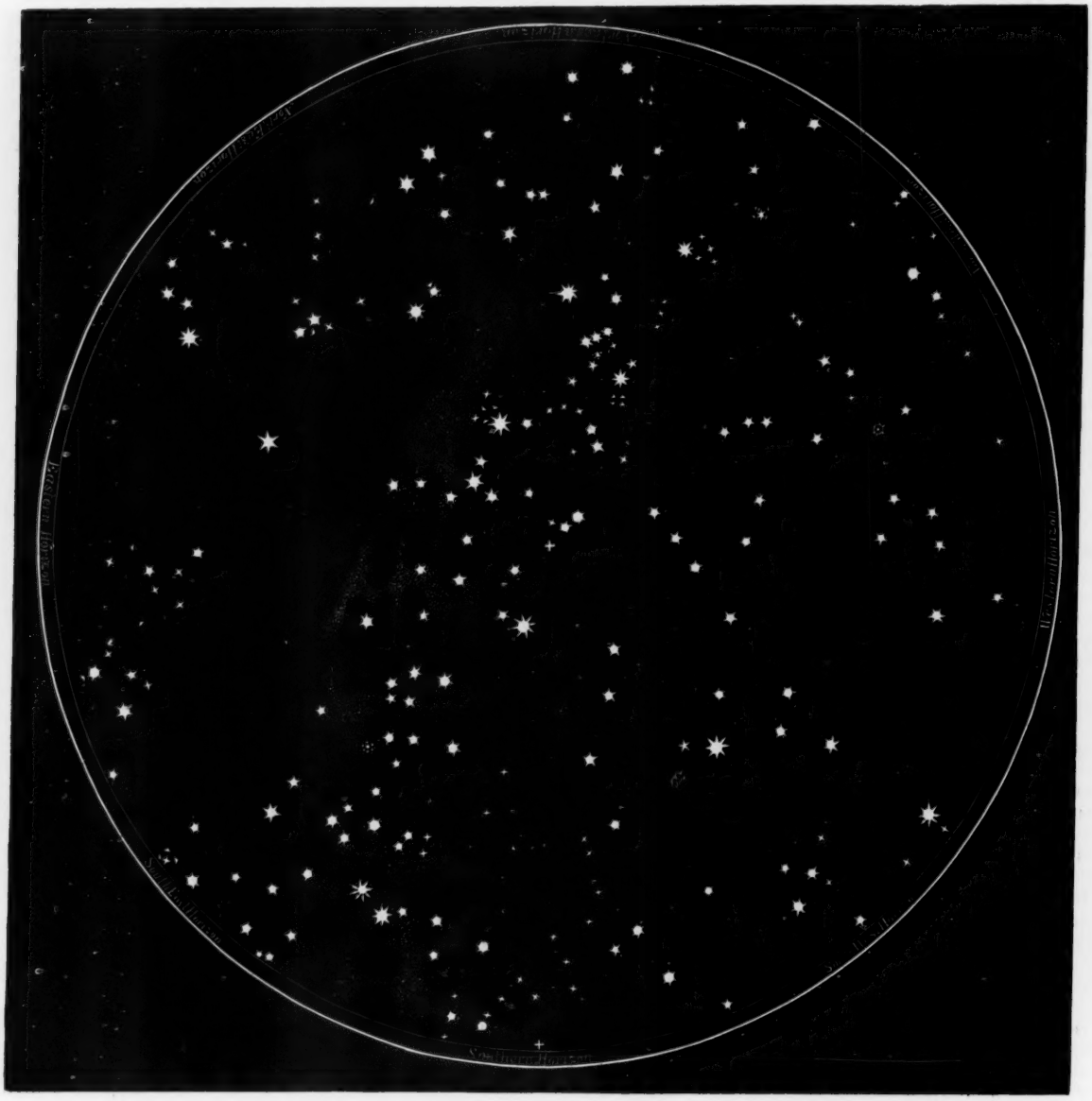
After travelling southward to about 38° north, the bright star *Canopus* comes into view somewhat east of south. At about 25° north latitude the Greater Magellanic Cloud begins to be seen due south. Soon after the whole of this strange congeries of stars and star clouds has become visible, the southern horizon, shifting southwards, passes below the whole of *Argo* on the eastern side, and the whole of *Eridanus*, even to the bright *Achernar*, on the western. As thus seen *Argo* certainly suggests no resemblance to a ship, unless the imagination rises to the thought of the stern half of a ship plunging almost vertically downwards beneath the waves. But with that idea, and including half the constellation *Canis* and the whole of *Columba*, remembering also the form of the old-fashioned ships such as Egyptian, Greek, and Roman carvings show them, we have about as fine a star-drawn picture of a foundering ship as could well be expected. It adds to the interest with which we thus contemplate the conception of very ancient imaginations, indeed, to consider that the great star-ship thus seen in our days so strangely situated was like a ship drawn stern foremost into harbour (that is, only slightly slanted) in the days of Eudoxus and Aratus. The Great Ship was on an even keel, and the whole of it—from its poop, where we now see the Greater Dog, to its bows, where we now see the *Centaur*—was well above the horizon of the Great Pyramid and Babylon—nay, of Athens and of Rome—fifty-two or fifty-three centuries ago, when the Great Pyramid was built.

At the equator the south pole rises above the horizon—we cannot say it comes into view, for it is not marked by any conspicuous star. At this time the Southern Cross, *Crux*, is rising into view in the south-east, but not in that position which suggests the idea of a cross; indeed a traveller who had reached the equator at the season corresponding to Map II., and only observed the heavens during the hours before midnight as he travelled south, could not at all have recognised the cross-like appearance of this small constellation; nor could he recognise it afterwards. The Southern Cross, paradoxically enough, is only properly

* It should be noticed that equal distances along the horizon are represented by equal distances along E O W. Moreover, those star-groups to which we direct chief attention in this use of the map, viz., those low down towards the south (near O therefore) are very little distorted. It is near the circumference of all these maps that the chief distortion, resulting from showing a hemisphere in a circular map, comes in. We have a fair picture of the horizon constellations *Canis*, *Orion*, *Lepus*, *Columba*, and *Eridanus*, in the second map of our series. In this sense the maps of the present series will form a useful supplement to the maps of my Star Primer, as those in like manner will form to these; seeing that the constellations near the horizon are distorted in one set (as if stretched out parallel to the horizon) and undistorted in the other, and *vice versâ*. Note further that the maps published each month serve as well (though for different hours) for England, where they appear at once as for southern places, which they only reach two months or so later.

seen as a cross in the northern hemisphere. This we shall see more clearly in studying later maps.

Passing farther south still, our traveller finds the south pole rising, the north having now passed out of view. The pole star—I mean our northern pole star—cannot be seen further south than latitude 1° 50′, and then only through the refractive action of the air, and when the pole star is is no conspicuous star close by the pole. If the night is very clear and dark, however, the traveller will be able to detect, close by the south point of the horizon, determined as I have just indicated, three small stars in a row. These are very close to the true pole, and will be seen to occupy the same region all through the night, only altering in position, like the hand of a small dial set just above the



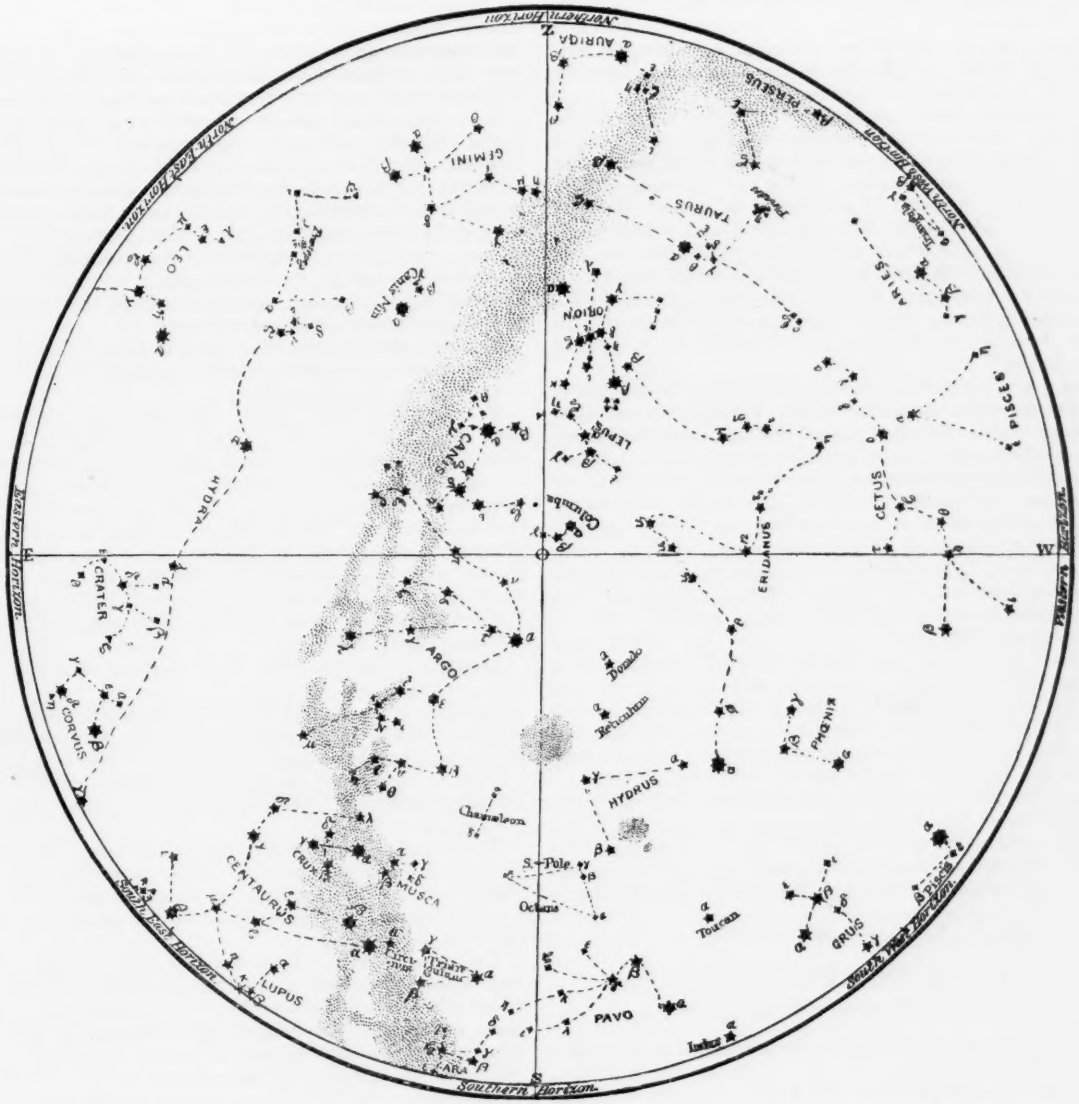
The Night Skies in the Southern Hemisphere (Lat. 46° to 24° S) and the Southern Skies in England (Upper Half of Map only).—For Index Map see opposite page.

at its greatest distance above the pole as seen in northern latitudes. In February, for a short time after sunset, the traveller when a degree or so south of the equator can see the pole star above a sea horizon, marking almost exactly the north point of the horizon. The point of the horizon almost exactly opposite is at this time about a degree and a half below the true south pole of the heavens. But there

southern horizon. It is as well to identify these small stars at this favourable time, when the observer, being a degree or so south of the equator, sees them close to the horizon. Later the observer may only be able to detect them with some difficulty.

Travelling farther south the south pole rises higher and higher, until, when in latitude 38° south, the stellar skies

present the exact scene indicated in Map II., at the times mentioned underneath it. In any latitude between 30° and 46° south the map will serve very well for the identification of the principal star-groups. As an illustration of this range in the latitudes over which such maps can be used, I may mention that the maps of my "Star Primer," constructed specially for the altitude of the middle of England, have been used in America as far south as latitude 38°. Maps constructed for latitude 38° north or south, might with equal propriety be used for latitude 52° (north or south respectively), or for latitude 24° (north or south); but instead of this wide range of 28° I would suggest only a range of about 16°—viz., from 30° to 46° (north or south respectively). And, of course, the nearer the latitude of a place is to 38° the more correct the present series of maps will be found.



THE NIGHT SKIES IN THE SOUTHERN HEMISPHERE (LAT. 46° TO 24° S.) AND THE SOUTHERN SKIES IN ENGLAND (UPPER HALF OF MAP ONLY):—

1 o'clock morn, Dec. 7	11 o'clock, Jan. 7	9 o' lock, Feb. 6
12.30 o'clock, Dec. 15	10.30 „ Jan. 14	8.30 „ Feb. 14
Midnight, Dec. 23	10 „ Jan. 22	8 „ Feb. 21
11.30 night, Dec. 30	9.30 „ Jan. 29	7.30 „ May 1

USE OF MAP II. IN SOUTHERN LATITUDES.

When using the map in the latitudes for which it is specially intended the student is to remember that the rim of the map represents the horizon, while the centre marks the point overhead. Thus, to determine what constellations lie towards any point of the horizon, the student is to bring

XUM

the corresponding part of the map's circumference below the centre O, and to consider only those groups which he finds lying between O and that part of the circumference.

Thus, towards the south he sees *Pavo* the Peacock; low down, and upside down, half of the Altar, *Ara*, being visible slightly to the east of south, and in a similarly inverted position. Above the altar, and eastwards of it, lies *Triangulum* the Triangle (the northern constellation similarly named shows two triangles, and may be conveniently called the Triangles or *Triangula*, as in both my Library and School Star Atlases.)

In the south-east is a singularly interesting region of the heavens. Low down is *Centaurus*, the Centaur, the bright star Alpha in which is celebrated as the nearest star (so far as is known) in the heavens. It lies at a distance of only about twenty millions of millions of miles from the solar system; a light journey of about three and a half years. *Crux*, the Southern Cross, occupies the place where formerly were the Centaur's hind feet—a change which has injured the latter constellation, without giving the southern skies a constellation in the least resembling a cross, except when so high above the horizon that the suggestion of an upright cross is lost.

In the south-eastern quadrant the Milky Way is full of strange features: the great Coalsack, a sharply-defined semicircular outline near λ *Centauri*, and the great fan-shaped expansions in Argo, between which is a broad dark space. But still more remarkable than the Milky Way here, or than the *Magellanic Clouds* seen high in the south, is the immense starless tract running between *Hydra* and the Milky Way. Indeed, although the groups forming *Corvus* the Crow, and *Crater* the Cup, here come close up to Hydra, of which doubtless they originally formed a part, the starless region farther northwards is only broken (so far as conspicuous stars are concerned) by the solitary star Alphard (α *Hydræ*), over the whole space between *Argo*, *Canis*, and *Orion* along one side, and *Leo*, *Cancer*, and *Canis Minor* on the other. Even Cancer contains so few bright stars that it used to be known as the dark sign, and beyond Cancer northwards the starless space expands over *Lynx* and *Camelopardus* (unseen in the southern skies).

In the north-western quadrant we find *Taurus*, *Aries*, *Cetus*, and *Eridanus*, in the places shown in the map; and in the north-western quadrant the rest of *Eridanus*, *Hydrus* (the Water Serpent), *Phœnix*, *Grus*, and a part of *Piscis*, the Southern Fish, with the bright star *Fomalhaut* (and *Piscis*).

NOTES ON AMERICANISMS.

By Richard A. Proctor.

Far's-I-know, which Bartlett for unknown reasons writes "Farzino," is an abbreviation of "as far as I know," often heard in New England and New York. Common enough in England.

Favoured. Bartlett wildly remarks that the use of this word as applied to the face, once common in England, is now obsolete, giving as examples of the old English, use of the expression Shakespeare's "A good *favour* you have, but that you have a hanging look," and from the *Spectator* the sentence, "The porter owned that the gentleman *favoured* his master," meaning that he resembled him. These are examples of two entirely distinct ways of using the word; but neither one nor the other is obsolete. The former, as when we say the man is *ill-favoured*, or *well-favoured*, is not only not obsolete but is in use by persons of culture and admitted into the best dictionaries; it shows, so far as I can judge, no signs of going out of favour. There is, however, an extension of the usage which I believe to be seldom heard out of America, viz., in such expressions as *long-favoured*, *square-favoured*, or the like, meaning that the face is long or square, or so forth. The other use of the word is common in England, but not admissible in literature or in the conversation of educated persons. Thus you will hear almost anywhere in England the remark, "So and so favours his father," meaning that he looks like his father in the face. I remember hearing the expression for the first time, and being very much perplexed by it, when I was a small boy; a nurse who had left my mother's service some time called one day with a baby, which she showed with some pride to her former mistress. Presently she remarked, "I think he favours Master Richard," which astonished me, as I had seen no marks of any special favour towards me—on the contrary, he had howled obtrusively at my approach; but since then I have heard the expression dozens of times among the poorer classes. In Walker's dictionary we find this use of the verb *to favour*, as well as the Shakespearian use of the noun "favour" for the features, presented without any suggestion of obsoleteness or even of obsolescence.

Fearful, used as we use "awful," fearful big, fearful ugly, and so forth, seems appropriately enough to be peculiar to the Quaker State Pennsylvania.

Feaze, same as *feeze*, *pheeze*. Bartlett seems quite in the dark about this good old English word, which he derives from the French *fâcher*, to vex. It was used formerly in the same sense as *tease*, as in teasing wool, but more particularly applied to curry-combing. It has no connection whatever with *fâcher*. "I'll pheese you in faith," says Christophero Sly, meaning that he will vex the worthy hostess by staying like teasel in wool. In America *feaze*, *feeze*, and *pheese* are still used not only in speech but in writing. "When a man's in a feeze there's no more sleep that hitch," says Sam Slick.

Federal Currency. The legal currency of the United States.

Feed, for *grass*, as "tall feed" for "high grass."

Feel, short for *feel inclined*, is used in America, where in England people are more apt to say, "feel like doing." "I don't feel to work to-day" would correspond with our English colloquialism, "I don't feel like working."

Feeze, see "Fease."

Fellow, short for "Black Fellow," is Southern. "Fellow," or "feller" for sweetheart is rather absurdly given by Bartlett as an Americanism. It would be difficult to say whether it is more commonly heard in that sense in America or in the old country.

Fellowship, To. "To fellowship with" is one of the real Americanisms which the *Saturday Review* would like to see alone in such a list as this. It is used chiefly in religious newspapers (the vulgarity of which in America has become a by word), to indicate communion in religious doctrine and discipline. The barbarism assumes two forms: thus a Baptist (let us say) may refuse "to fellowship" with a Methodist, or refuse "to fellowship" him, or *vice versâ*.

Female. Bartlett complacently discusses the use of this word for "woman" as an Americanism. Would that it were the invention of our Transatlantic cousins; but, alas! the vulgarism is but too obtrusively English to be thus got rid of. It is not only English, but the Queen's English, not in the vulgar use of that absurd expression (absurd seeing that the Queen's German is fifty per cent. better than her English), but literally; for did not the Queen write to the Mayor of Birmingham, expressing her "horror that one of her subjects—a female—should have been sacrificed," &c., the sacrificed "subject" not being a cow or a female retriever, as might be imagined, but a woman who had fallen from a rope on which she had tried to walk blindfolded, and in a

sack. Our Mrs. Browns are rather fond of applying the term to themselves—though I am not aware that they ever, as "Arthur Sketchley's" Mrs. Brown is made to do, call themselves "fieldmales." If you speak of a housekeeper as a "woman," even addressing her as "my good woman," she will be ready to tear your eyes out; but if you speak of her as a "female" she is rather flattered than otherwise. Why "a male" has not yet come to be regarded as an appropriate way of describing a man is not clear. Possibly we shall learn the reason when we find out why a woman may be called simply "a petticoat," while no one ever yet thought of making "a pair of breeches" do duty for a man.

FEN, To. It is interesting to learn that this word is still used by American boys, as by boys in England. *Fain* we used to pronounce it at school. In London, "fain larks" is synonymous with "stow larks," that is "no tricks, I entreat of you." Probably "fen" is nearer the original sound, the word having probably been "fend" in the sense of "keep off," "avoid."

FENCE. To be "on the fence" corresponds in America to being "Jack-o'-both-sides" in English. A man who tries to run with the hare and hunt with the hounds is "on the fence"—"impartially ready," as Lowell puts it—

"... to jump either side,
And make the first use of a turn of the tide."

A man on the fence is apt, however, to give offence to both sides, instead of pleasing both as he fondly hopes to do.

OUR PUZZLES.

IN fig. 1, we have the solution of my new and improved puzzle (No. X.) about nineteen trees, according to which they are to be arranged, not in *nine* but in *ten* rows, five to each row.

In fig. 2, we have the solution of my improved form (Puzzle XI.) of the puzzle about cords and pegs, according to which six cords (all equal in length, if it be preferred to add that condition) are to be so fastened to nine pegs as to inclose (1) six triangular spaces all equal and similar, (2) three quadrangular spaces axially symmetrical, and (3) one hexagonal space having equal sides and three axes of symmetry.

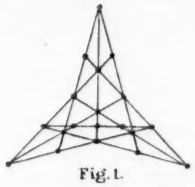


Fig. 1.

SHOWING NINETEEN TREES IN TEN ROWS, FIVE IN EACH.

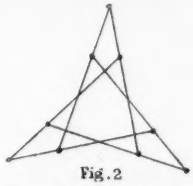


Fig. 2

SHOWING SIX EQUAL CORDS, FASTENED TO NINE PEGS, AND INCLOSING TEN SPACES SYMMETRICALLY.

PUZZLE XII. When I turned to the investigation of this puzzle, I found that it was not the same as Mogul's Puzzle in Vol. 1. (rather ridiculously indexed The Mogul's Puzzle), but slightly more difficult because more general.

It may be presented in two forms; thus:—

Given a rectangular carpet, to divide it by the fewest cuts into pieces which shall cover

1. An equal given rectangular area, or
2. An equal rectangular area of given shape.

Of course problem 2 involves the solution of problem 1, which was Puzzle XII. as given; but it is well to note that this, the more general form, may be dealt with directly: by which I mean that instead of first finding out by geometry the sides of the rectangle fulfilling the conditions in 2, and then solving the puzzle for that rectangle, we may employ a construction which, in solving the puzzle, will give us the rectangle both in shape and size.

Two solutions of the second form of the problem are illustrated in figs. 3 and 4, the preliminary construction

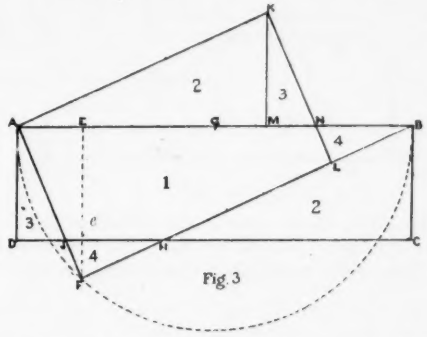


Fig. 3

being only given in one case. The given rectangle is ABCD, and the rectangle AE*e*D, cut off from the length of AC, represents the shape of the rectangle to be covered by sections of AD, AE corresponding to the shorter side. On AB the semicircle AFB is drawn, E*e* produced to meet it in F, and AF and FB, cutting DC in J and H, are drawn; then AF is one

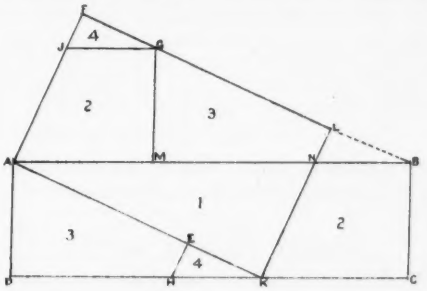


Fig. 4

side of the required rectangle, and BH is the length of the other. Completing the rectangle FK, we get the remaining cutting line, NL, in the case illustrated by fig. 3. In the other case, FB lies wholly above AB; but AK, parallel to FB,

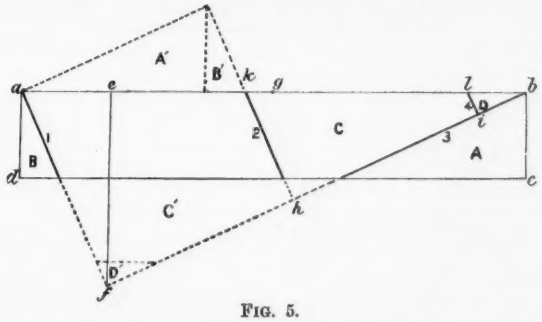


FIG. 5.

cuts DC in K, giving AK, the other side of the required rectangle, which we complete by drawing KL. Then to complete the cutting lines we have to take EK equal to LB, HK equal to NB, and join HE.

The numerals in both figures show how the pieces of rectangle AC fit upon rectangle AL.

There result many varieties of cutting, according to the shape of the given and required rectangles. Figures 5, 6,

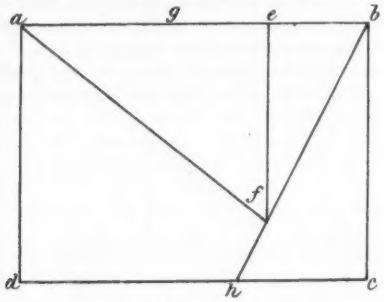


FIG. 6.

and 7 (Mogul's), show some of the varieties for the first method (*hi*, in fig. 5, is equal to *fh*. Where either rectangle is very long, more equidistant thwart cuts parallel to AF,

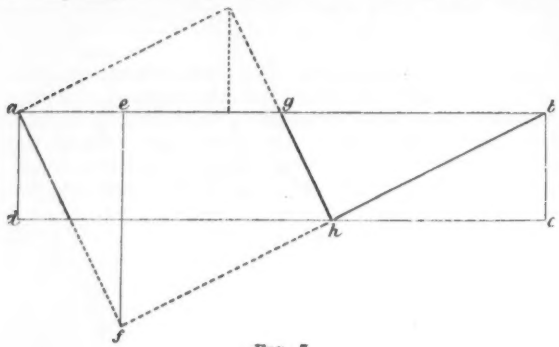


FIG. 7.

or *af*, will have to be made). Similar diversities will readily be dealt with in the case of the second method.

PUZZLES FOR THIS MONTH.

PUZZLE XIII. *Show how a parallelogram, as* ABCD, *fig.* 8, *may be divided by the fewest number of lines so that the*

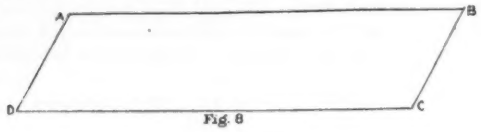


Fig. 8

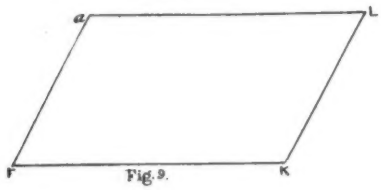


Fig. 9.

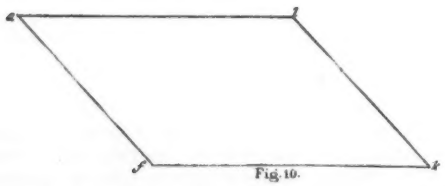


Fig. 10.

pieces may fit another parallelogram, AFKL, *fig.* 9, *having angle at a, equal to angle at* A, *by a method akin to the first described above.*

PUZZLE XIV. *Show the same by a method akin to the second.*

PUZZLE XV. *Divide* ABCD, *fig.* 8, *into three pieces so as to cover the parallelogram afkl, fig.* 10.

THE WHIST-PLAYERS' PUZZLES.

(See KNOWLEDGE for October and November.)

IT *is required to arrange sixteen persons to play whist on five days, each day retaining their places unchanged throughout, so that no two shall twice sit at the same table.* I take first the subordinate puzzle:—*To arrange twelve persons to play whist on five days—single dummy on four days, full whist only on the remaining day—no two sitting twice at the same table.* The direct method of solution is similar to that employed for the fifteen school-girls. It would take little time to run through the combinations, because we might at once set out three combinations of four each, the single day of full whist, and these limit us effectively in making out the sixteen combinations of three each out of which the four days of single dummy are to be provided for.

But the simplest way of proceeding is as follows:—

Write after A four pairs of letters, and one triplet, in alphabetical sequence, giving the first table of the following set:—

Table I.	Table II.	Table III.	Table IV.	Table V.
A B C				
A D E				
A F G		B E J	C D J	D G L
A H I	B D F H	B G K	C F K	E H K
A J K L	C E G I	B I L	C H L	F I J

To make the other sets of four take the two columns headed B and C in the first table, getting the second table. Get three sets beginning with B by taking E, G, and I from the right-hand vertical column of Table I. with J, K, and L of the lowest row; and get three sets beginning with C in like manner. These form Tables III. and IV. Lastly, get three more combinations by taking D, E, and F, each with the only pair of the letters G, H, I, J, K, L, remaining available—getting Table V.

From these sets we obtain quite easily the following solution:—

1st day.	2nd day.	3rd day.	4th day.	5th day.
A B C	A D E	A F G	A H I	
D I K	B G K	B I L	B E J	A J K L
E F L	C H L	C D J	C F K	B D F H
G H J	F I J	E H K	D G L	C E G I

Take now the problem of the sixteen. We have first to get twenty combinations of four, no two in any of which will be twice in the same set. To do this we begin with Table I. below, written out in the usual way:—

Table I.	Table II.	Table III.	Table IV.	Table V.
A BCD				
A E F G	B E H K	C E L N	D E O I	
A H I J	B F N J	C F I M	D F K P	E P J M
A K L M	B G O M	C G H P	D G L J	F H L O
A N O P	B L I P	C K O J	D H N M	G K N I

We deal with the twelve letters E F G . . . to P (lined off in Table I.), so as to form from them four arrangements, just as the four arrangements belonging to the 2nd, 3rd, 4th, and 5th days above are formed

from the arrangement belonging to the 1st day. (We may either do this independently, or, in the arrangements just obtained for five days, we may write throughout E for A, F for B, G for C, H for D, I remains I, J for K, and so on; that is, for each letter in the 1st day's arrangement, write the letter in the corresponding part of the portion of Table I. lined off.) We thus get four arrangements to be taken with B (those corresponding to the 2nd day's arrangement in the former problem, giving Table II.; four to be taken with C (those corresponding to the 3rd day's arrangement), giving Table III.; and four to be taken with D (those corresponding to the 4th day's arrangement), giving Table IV.; while there remain three sets of four which form Table V., and complete the required 20 combinations of four letters in which no two letters appear twice together.

We now have to work these 20 combinations together to give us the arrangements for our five days' play. We have very little trouble in obtaining the following result:—

1st day.	2nd day.	3rd day.	4th day.	5th day.
A B C D	A E F G	A H I J	A K L M	A N O P
E P J M	B L I P	B G O M	B F N J	B E H K
F H L O	C K O J	C E L N	C G H P	C F I M
G K N I	D H N M	D F K P	D E O I	D G L J

Gossip.

By Richard A. Proctor.

I should have thought that if anything could be clear from my remarks on the *Saturday Review* critique of my "Notes on Americanisms," it would be that I remained in doubt as to its authorship. But as I find from letters which have been addressed to me on the subject, that I quite obviously suppose A wrote it, as obviously suppose B wrote it, and not less obviously attribute it to C, it is evident I must be mistaken. At the outset I stated in so many words that my critic *might* be one I had condemned with deserved severity for some offence of his, yet A and B, whom I never have condemned severely or mildly, deservedly or otherwise, believe that I certainly considered each of them (severally) to be the author. I stated with equal distinctness that my critic *might* be one who had received at my hands nothing but kindness, and A and C, to whom I am under personal obligation for kindness received, consider I *must* mean them, severally and individually. I spoke of envy as having possibly moved the author; yet B and C, who have assuredly no reason to envy me, and whose work I admire with a feeling not indeed envious, but implying a clear perception that they severally are able to do well what I wish vainly I were able to do at all,* take my remarks to themselves.

* * *

Then again, I collect *more meo* (or rather in the usual scientific way) all the points of evidence I can recognise, noting them *en passant* as points to be considered when—hereafter—I endeavour to form an opinion as to the authorship of the critique; and A, B, and C, to each of whom some of those points seem to correspond, consider that I must have already formed my opinion and that it must point to them individually and severally! I express a certain degree of confidence as to who has certainly not written the article, or as to circumstances which must probably not be understood precisely as they seem; and it is incontinently assumed, equally by A, by B, and by C, that such negative inferences imply positive conclusions:

* * *

I write these lines at a fortnight's postal distance from London, and therefore it will be understood that I have not seen the November number of Knowledge. I am told, however, that one of the most esteemed of all those contributors who have put me under obligation by writing articles for Knowledge, one in whom I have such full confidence that the printers have standing instructions to put whatever he may write for us in type forthwith, has thought it necessary to explain in Knowledge that he is not the author of the *critique*. I hope this is not so, or that he has changed his mind in the *interim*. Being in doubt on this point, I write necessarily under somewhat inconvenient conditions. But I can do no harm by saying that though some of the points of evidence noted in my remarks may correspond with him, nay with him alone, they are not such points as would determine the authorship, and are flatly contradicted by points far more directly and obviously decisive. A man might communicate from some distant place casual notes on errors I may have made (or which I seem to have made) without any unfriendly feeling, and without any idea that such notes were to be used in a spiteful or unfair manner; yet evidence suggesting that the idea of certain criticisms had come from such a place, would have to be considered in arriving at a conclusion. The same man might have started the first idea of a quaint jest without being at all responsible for its spiteful application by someone else nearer headquarters. The evidence apparently referred to as pointing to him, may—and in this case must—point to someone else, and yet might be of use as indicating some one likely to have come across ideas which had been thus quite innocently advanced.

* * *

There should, however, in this case have been enough to show that, whatever indirect influence I might rightly or, perhaps, quite wrongly have attributed to that friend at a distance, I could not have attributed the critique to his pen. His style is unmistakable; I believe no one living could imitate it effectively; the style of the critique is altogether different as well as altogether inferior. His tone is uniformly and emphatically manly; the tone of the critique is not even mannish, but, as I definitely pointed out, womanish. He certainly could not have fallen into one out of ten of the mistakes which crowd the *Saturday Review* "Notes on Americanisms." Moreover, it is clear that if my remarks were all intended to apply to one person, instead of being conditionally applied to at least four (to this one under such and such conditions, to another under others, and so forth), then I must regard that one person as a false friend, who has repaid kindness with injuries. Now I have spoken above of my friend at a distance, and he will, I trust, permit me to speak of him as a friend in that sense; but the esteem and admiration one may feel for a man whom one has met but four or five times, would certainly not justify the suggestion of long and intimate antecedent friendship implied when such an expression as "false friend" is employed. Only one who has been a close friend for years can show himself a false friend. Adding to this, the consideration that he has never been in the slightest degree under obligation to me—but I, on the contrary, to him—my friend ought not to have considered that I imagined him to be the writer of the critique, though I may have imagined (quite erroneously, I now know) that the reviewer had tipped some of his arrows with metal from my friend's mind, while I fully recognised that the bow and the arrow,

* *Qui invidet minor est*, says the Cadogan motto, justly; but it does not necessarily follow that *Qui minor est invideat*.

XUM

and also the venom in which the arrow tips were dipped, belonged wholly and solely to another.

* * *

A CORRESPONDENT calls my attention to the name "Krishna Jezeus." He says that he has come across the epithet Jezeus as applied to Krishna in several modern treatises, but it is not a correct transliteration of anything possible in Sanscrit or in any of the Dravidian languages of South India. He has failed to find any original authority for the name. Like my correspondent, I am unable to understand the modern use of this epithet, which I have used as I found it, supposing it might be a form of one of "the thousand names of Krishna"—with some of which I am not familiar. I noticed its want of resemblance to the better-known names, most of which end with the vowels "a," "u," and "i," as Dâmodara, Mâdhava, and Madhuripu, Achyuta, Kes'ava, Govinda, Hrishikes'a, Trivikrama, Vâsudeva, Padnanâbhi, &c., &c. Knowing absolutely nothing as to the real source of the epithet, but recognising it as an impossibility in connection with any Indian language, I venture the suggestion that it may have been borrowed from some ancient Latin writing, in which, because of the close resemblance between the story of Krishna (the representative during his life on earth of Vishnu, the second person of the Indian Trinity) and that of Christ, Krishna is called Jezeus; in other words, it may be a barbarous attempt to find some adjective other than Jesuit which would represent association with, or resemblance to, Jesus—so that Krishna Jezeus would signify the Jesus-like Krishna. But I should say the chances must be heavy against this guess being correct.

* * *

A CORRESPONDENT at Bristol has addressed to me a rather remarkable letter, the bearing of which may perhaps be more obvious to some of my readers here than it is to myself. He asks (1) whether Shakespeare was not a grander creation than a myriad suns? (2) whether the New Testament is not greater than Shakespeare? and (3), "as to miracles," whether I have never heard that warts have been miraculously cured (citing a case in which a clergyman was converted from the errors of his ways (in regard to warts) by the success of "charms" devised by a drunken and disreputable member of his flock). Not in the least knowing what he (or she) may be aiming at in applying the Socratic method with these three questions, I draw my bow at a venture in demanding, by way of reply, (1) whether Euclid was not a grander creation than the solar system? (2) whether a stained window by Burne Jones is not greater than Homer? and (3) as to evolution, whether my correspondent has never heard that Pat's caubeen has been evolved from the cocked hat of the seventeenth century? I trust this may be of use to my correspondent, but I cannot tell; I hope so, I am sure.

* * *

A CORRESPONDENT asks whether he may, "with a mind fresh from any preconceived ideas, and therefore unpledged to any particular theory," suggest that, owing to the greater mass of the earth, the lighter matter, "such as oxygen and hydrogen," &c., would go to the earth while the denser matter would be all that the moon could collect? One may suggest anything—especially with a mind fresh from any bewildering study of previous researches and inquiries. But this particular theory, that if two neighbouring bodies of different mass were gathering up material the larger would sift out the lighter elements, leaving the smaller to collect the denser, will really not do.

* * *

I DO not undertake to consider here all such ideas as may be propounded in letters; but it seemed to me worth while to notice that the state of unpledged freshness, which my correspondent seems to think favourable to the conception of sound ideas has never yet proved trustworthy. *No one has ever discovered any new truth of importance who has not carefully mastered pre-existing knowledge of the department of science to which the truth belongs.*

* * *

A REMARKABLE passage from a paper called *The Christian* has been sent me for my opinion. It says that though there was a "fine tone of candid appreciation of the evolutionary philosophy" at the Birmingham meeting of the British Association, "there was a clear divergence from its extreme conclusions." It proceeds to say of certain remarks uttered by the President of the Anthropological Section, that "they go far to sustain the language of Sir William Dawson in a paper published this year, that the ordinary received chronology of about four or five thousand years for the post-diluvian period, and two thousand years or a little more for the antediluvian period will exhaust all the time that geology can allow for the possible existence of man." I am asked what I suppose would be the opinion of science on this amazing statement, and whether Sir W. Dawson is a high authority on such matters.

* * *

IT would be idle to reason about a statement which flatly contradicts everything that palæontology, biology, anthropology, ethnology, philology, archæology, and associated sciences say on the subject of the antiquity of man. No one, however, who has read what Sir W. Dawson has written about evolution can wonder at anything he may have said "this year" on that particular subject. At Birmingham, I believe, he kept within his own ground, and though geologists differ widely from much that he said about the Atlantic basin, while events closely following knocked incontinently on the head the geological opinions he had most confidently expressed, his views on matters simply geological are always worth considering. But a man may be skilful in certain departments of geology, who cannot or will not grasp the meaning of any facts outside, and every one who knows Sir W. Dawson's record must be well assured that if he saw directly before him evidence which would be likely to make the views of Darwin seem acceptable to him, he would go miles round rather than continue on his direct way.

* * *

YET I find it after all difficult to believe that even Sir W. Dawson—bigoted though he is in his hatred of Darwinism—would have said what the *Christian* attributes to him. Nobody can know much better than he can (if he will) that (1) palæontology has proved the existence of man for at least 100,000 years; (2) biology shows that the race of man as it exists now could not possibly have arisen from the in-and-in breeding of the descendants of two persons four or five thousand years ago (without a series of miracles extending over many generations); (3) anthropology and ethnology emphasise this argument by the evidence they supply as to the varieties existing in the human race and among different nations; (4) philology enables us to recognise periods many times longer than the four or five thousand years spoken of, as necessary for the development of the existing types of language; (5) archæology indicates the existence of races in widely separated parts of the earth, who were so numerous (to say nothing of their advance in civilisation) at a period separated by but a few hundred years from the time assigned to the flood, that the idea of their being all descended from two persons within that time is simply childish; and (6) history shows us the great nations of old existing in their millions when, were that

account of the origin of the human race correct, there could not have been five thousand persons living all over the fifty millions of square miles of land surface on our planet. But it seems idle to talk about matters so well known, respecting which there has long been but one opinion among all who are in a position to form an opinion at all.

* * *

THE heel of the negro would not have been developed from straight-heeled ancestors, or the heel of the Caucasian from ancestors heeled like the negro, or the two forms severally developed from ancestors with any intermediate degree of backward curvature in the heel, in ten times the period named by the *Christian*.

* * *

THE Rev. Mr. Talmage, whose singularly unpleasant preaching (in which ulcers and sores are the favourite forms of imagery) seems to find favour in America, has finally found an argument for the overthrow of what he has characteristically called the "putrid" theory of evolution. "The survival of the fittest," he says. "Yes, the fittest always survives, does it not? Guiteau, the murderer, survived Garfield, our good President, for several months. Of course, Guiteau must have been the fitter of the two. So, at any rate, say Darwin and Huxley and Spencer, for they tell us the fittest survive."

* * *

THE same earnest preacher (terms 500 dols. per sermon) deems it not blasphemous to rebuke blasphemy thus:—"A wretch half maddened by the delirium of drink raved against God the other day in the fields; rebuked by his neighbours he grew bolder in his denunciations, proclaiming that if God appeared there to punish him, he, the wretched drunkard that he was, would whip the Almighty. Then was God's wrath aroused against that man. Smoke came from his mouth. Those who had heard him blaspheme drew near to watch him breathing out fearful flames, and shrieking in the agony justly inflicted by an angry God. The blasphemer perished, slain with fire by the God he had offended." Of course, no such event as this really happened. Mr. Talmage is not a truthful man. But if a man had died under such circumstances, would it not be as blasphemous to impute the manner of his death to an allwise and infinite Being, as it would be to impute to God's special will the crime of some murderer, or the misconduct of this poor wretch himself? If we should think meanly of a man who, being insulted by a helpless drunkard, should beat him into the gutter, what are we to think of a man who attributes to God what we should thus despise in a man?

* * *

THE world may be divided, so far as ethical religion is concerned, into three great classes:—

First, those who think "This is *my* duty;"

Secondly, those who say "This seems *our* duty;" and

Thirdly, those who teach "This is *your* duty."

Usually the first class do what they think their duty; the second, with a wider sense of duty, try to fulfil it; the third are apt to be so intent on the inquiry whether others do their duty as to have little inclination left for attending to duty themselves. *Medio tutissimus ibis*; the middle class of the three is the best, though much may be said for the first. Distrust the third.

* * *

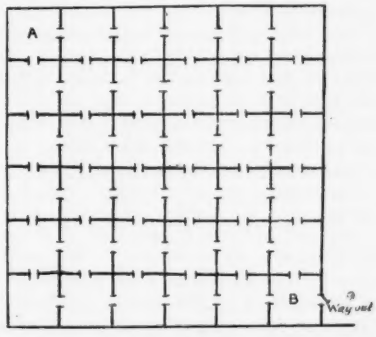
I FEAR the Bishop of Carlisle will be attacked in lively fashion for his article in the *Contemporary Review*, in which he adopts much the same view of the connection between the seven days of the week and the seven planets as I have indicated in my articles on "The Unknowable." Still less will it be liked that he should advance as possible what science has long since recognised as certain, that the Genesis cosmogony is but a speculation, and as certain what science has long since recognised as obvious, that it has no scientific value. But he falls into error in describing the interval between full moons as 28 days, and therefore asserting that there are more nearly 13 than 12 lunar months in a year. There are 29·54 days in a lunar month, and 12 such months cover 354-5 days.

* * *

FROM a clerical correspondent I have received a letter courteously inviting me to say what I believe in regard to the "Josephus question." "You should go on," he says, "to tell us what you believe to be a correct account, so that we may judge whether we are not thereby landed in greater difficulties than meet us in accepting the orthodox account." Here the word orthodox manifestly bears only its conventional meaning, for orthodox used in its correct meaning would involve a *petitio principii*.

* * *

I ORIGINALLY presented the "Josephus question" as an "historical puzzle," and, unlike the puzzles which are now appearing monthly in these columns, it is not one to which I have undertaken to give a solution. If I had I might have found myself much worse "put to it" than I did when coming to the problem of the sixteen whist-players who were to have five sittings without any two ever being at the same table; I found I could not get a solution quite so quickly as I had expected. I felt sure when I asked that question that there must be a solution, and I supposed there would be no difficulty in finding it; but it took me longer than I cared for: and only the sense of duty to readers, who might have failed, and who would expect the propounder of the puzzle to solve it for them, caused me to work the puzzle out. The Josephus puzzle, or rather the general puzzle, of which that particular perplexity is a part, might more aptly be compared, perhaps, to such a puzzle as the following, which *I believe* has a solution, but what that solution may be I by no means promise to tell—for a most excellent reason:—



The figure represents the plan of a prison with intercommunicating cells (bless the Latin); a prisoner in A is offered his freedom if he can make his way to B after passing once, and once only, through all the 36 cells. How is he to do it?

* * *

I HAVE in this matter of the historical and theological puzzle most carefully limited my statements to matters of fact, avoiding all expression of opinion. Such facts as are certain and admitted I have stated as such; where there is doubt I have indicated the nature of the doubts. I have indicated no inferences. If any consider that the *facts* point very definitely in a certain direction in which they would rather not look, that highly illogical (but very

common) state of mind is a phenomenon which interests me as a student of science, and of human nature as a department of science; but I am no more responsible for such disquiet than I am for the inherited mental or moral qualities from which it takes its rise. If, on the other hand, others consider that the facts have no such significance, I have asserted nothing to the contrary. Facts can always be studied with advantage by lovers of knowledge (with a small "k"); when they are rightly interpreted they tend to the increase of Wisdom (with a capital W): but whether for the moment they can be rightly interpreted or not, they cannot safely be neglected.

* * *

I PROPOSE to sum up in the next number matters of fact bearing on this question—noting that in various parts of the last volume of KNOWLEDGE these points have been dealt with in detail, and, so far as I know, scarce any of them have been regarded as open to doubt, let their interpretation be what it may.

Reviews.

Life Histories of Plants. By Prof. D. MCALPINE. (Swan Sonnenschein & Co.)—This is an extremely interesting book, the most important section of which, that dealing with the comparison of plants and animals on a physiological basis, deserves careful study. The author, wisely following the newer and sounder methods, lays stress upon the subordination of form to function, treating of the organism as a living thing whose work determines the mechanism. For the organ was made for it—not it for the organ. Did space permit, we should like to quote the author's admirable remarks on this matter, but we shall render both him and our readers kindlier service by urging the perusal of the book itself. The diagrams, especially that on p. 23, are even more helpful to clearer understanding of the text than the woodcuts.

Our Island Continent: a Naturalist's Holiday in Australia. By Dr. J. E. TAYLOR. (S. P. C. K.)—In this little book the author, who is well known as a writer of agreeable books on botanical and kindred subjects, narrates his impressions of a first visit to a land in which, as he happily puts it, the naturalist who is also a geologist may feel himself living in the Secondary Epoch, certain typical life-forms of which flourish there to this day. The geological history of Australia is admirably and clearly summarised, but when dealing with the fauna of the country we are surprised to find Dr. Taylor betraying ignorance of Mr. Caldwell's discoveries concerning the earliest mammalian forms in speaking of the marsupials as "the first mammals to be created." We suppose, apart from the error in this statement, that the form of its presentment is a concession to the weaker brethren of Northumberland Avenue, who still cling to the old notion of the immutability of species.

The Literature of Local Institutions. By G. L. GOMME. (Elliot Stock.)—The able and indefatigable Director of the Folk-Lore Society has made the subject to which this book is a convenient introduction his special study, and now that the reform and expansion of local government are imminent, he does good service in enlightening us concerning the origin and growth of the autonomous bodies which pulsated with vigorous life in shire and hundred and township, and which have made England the nursing-mother of free institutions and the successful coloniser alike in torrid and temperate zones. We advise all persons interested in municipal government to buy Mr. Gomme's work.

Horticultural Buildings. By F. A. FAWKES. New Edition. (London: Swan Sonnenschein, Le Bas, & Lowrey. 1886.)—The possessor of a garden must suffer woefully, either from lack of enthusiasm or from impecuniosity, who is content to do without "glass" in some form, however humble, in it. To anyone and everyone who may be desirous of possessing so necessary an adjunct, be it in the form of the humble garden-frame or of the lordly conservatory, Mr. Fawkes' book will be found a perfect mine of information. Not only does he tell the incipient horticulturist what to do, but also why to do it, theory and practice running *pari passu* throughout the volume. To such an extent is this carried that the work opens with a description of the cause of the seasons and a detailed account of the various angles to be adopted for the "pitch" of greenhouse roofs in different latitudes, so as to obtain the maximum heating effect from the sun's rays. The question of iron *v.* wooden houses is thoroughly discussed, and the whole of the leading existing systems of glazing equally thoroughly described. The subject of heating, too—that *bête noire* of the beginner—is exhaustively examined and explained. In fact, it is not too much to say that anyone previously ignorant of the subject might, after a careful perusal and mastery of the treatise before us, confidently design and supervise the erection of any forcing-frame, greenhouse, wall-tree protector, or conservatory ever likely to be required by the overwhelming proportion of those into whose hands it is likely to fall. There is also a chapter on meteorology and meteorological instruments; another on the law in connection with gardening erections, and so on. In fine, we may say, shortly, that no gardening library, country or suburban, can be held to be complete which does not contain Mr. Fawkes' excellent and painstaking volume. We may add that it is profusely illustrated.

Plane and Spherical Trigonometry. In Three Parts. By H. B. GOODWIN, M.A. (London: Longmans, Green, & Co. 1886.)—The work before us is a compilation, made under the sanction of the Lords of the Admiralty, for the use of the junior officers of the Royal Navy, and is designed to supersede the somewhat heterogeneous collection of text-books hitherto in use in that branch of the service. From his very considerable experience as a naval instructor Mr. Goodwin has doubtless not adopted the arrangement which characterises the present work without the most careful consideration of its applicability to the purposes for which it is especially designed. It seems, however, to us to suffer under the defect of all recent books on trigonometry—we mean that of treating its subject in too abstract a manner for the very beginner. We cannot help feeling that the modern fashion of dealing with the trigonometrical ratios, the defining sine and cosine in a particular way, and deriving all the rest from them, is scarcely the way to give the incipient student an *intelligent* idea of what he is endeavouring to master. The old-world reference to the circle, with its visible connection with the angular functions, certainly does show to what and of what certain lines are tangent and secant, &c., &c., as the case may be; and this idea once grasped, subsequent study is made much smoother and easier. It also seems to us that trigonometrical analysis generally is introduced full early into the work under review, though this mode may possibly have been adopted from practical experience of its utility. Our remarks refer rather to the manner in which our author has arranged his material than to that material itself, and must be held to apply strictly to the first division of the book, that on plane trigonometry; the second part—that on spherical trigonometry—is excellent both in matter and manner; while the concluding or practical section may be mentioned with equal praise. In fact, for fulness, lucidity, and appositeness, as

far as the large mass of examples is concerned, this leaves nothing whatever to be desired. In addition to the short list of errata on a slip inserted in the volume, we may note that on pp. 10, 26, and elsewhere the lines dividing the numerators and denominators of fractions have slipped out; that on p. 71 the log. of ·00527 is printed as 3·721811, which should, of course, be 3·721811; and that in example 20 on p. 224 "declination" appears where latitude is obviously intended. Such microscopic blemishes as these, however, can scarcely be held to detract from the value of a book which may be confidently recommended to all who desire to master the application of trigonometry to nautical astronomy and terrestrial surveying.

Liste Générale des Observatoires et des Astronomes, des Sociétés et des Revues Astronomiques. Par A. LANCASTER. (Brussels: F. Hayez. 1886.)—This is intended as a kind of directory of all persons and institutions connected mediately or immediately with astronomy, but it seems to us to be susceptible of considerable improvement. Names of absolutely unknown men have crept in, together with those of dead ones (such as Mr. C. E. Burton and Mr. R. C. Carrington) of more eminence; while, in the list of instrument makers, Simms is omitted altogether! On page 92 occurs the sole note appended to any name in the list, and, with reference to the one which does appear there, we must say that unless it was inserted by the request and with the sanction of the gentleman to whose name it is attached, (which we find it impossible to believe), we can only think that M. Lancaster has been guilty of a piece of very gross impertinence indeed.

The English Illustrated Magazine, 1886. (Macmillan & Co.)—There is no falling off either in the illustrations or letterpress of this excellent serial, which, with its four complete novels, one of which is from the vigorous pen of Mr. Christie Murray, and another from the delicate pen of Miss Veley, and its miscellaneous papers, makes well-nigh the welcomest, certainly the cheapest, gift-book of the year. Creditable to the taste and judgment of its conductors is the prominence given to insular and rural subjects, with their beautiful woodcuts of our old seaports, and of commons which are happily safe from the land-grabber.

Merciful or Merciless, by STACKPOOL E. O'DELL (London: T. Fisher Unwin, 1886), is a novel which should be read by all those who are inclined to take a desponding view as regards the future life. The book is entirely directed against the belief in everlasting punishment after death; but its strong appeals, both to the feelings and to the logical faculty, are so skilfully interwoven with the very interesting plot and with a variety of incidents that no odium whatever can be attached to it as what "Ouida" calls "that misguided thing, a novel with a purpose." The hero, George Graystone, having been overtaken by a storm when out at sea with his little companion, Florence Harper, is separated from her and picked up by a passing vessel, leaving her and all his friends in Daffydale, a village near Ventnor, to mourn him as drowned. This incident introduces the theme of the book, as Mrs. Harper believes that the boy's soul has been lost, owing to his want of faith in the doctrine as to salvation preached by her favourite minister, Mr. Heron. Florence, however, breaks away from this gloomy creed, unwilling to believe that a merciful God can doom any soul to an eternity of torture. George Graystone, who has been picked up, suffering from injury to the head, owing to the concussion of his canoe with the rescuing steamer, is carried to New Zealand, and in the hospital at Auckland he recovers, but with the loss of the memory of all his former experience, having to be re-taught to speak, read, and write. His name being unknown, he has been given that of the ship in which he arrived, "John Hammond," and this he unquestioningly adopts. Cases such as his are by no means unknown in the annals of psychological medicine, and the whole delineation of this character is skilful. Having grown into a strong man, he meets by chance with his former companion, Jim Harper, who has come to New Zealand to try his luck, since the family has grown poor under the religious extravagance of Mrs. Harper. The two make friends without recognising each other, and succeed in discovering and pegging out claims on a goldfield, which makes them both rich men. The excitement of sudden wealth is, however, too much for Jim, and he falls ill. While he is thus prostrated, he receives a letter from Florence to the effect that their mother has mortgaged their home, "The Petrel," in order to build a chapel for Mr. Heron, and that the house in which they were born will have to be sold. Jim being too ill to move, Hammond goes to England to stop the sale. He meets his father, Sir James Graystone, in the train going down to Daffydale, and the old gentleman is attracted to him, owing to his likeness to his son. They, however, quarrel when each discovers that the other's business is to buy the "Petrel." On coming amidst the scenes of his childhood, George Graystone's memory gradually revives, and his cure is completed by the sight of Florence, his child-sweetheart, whom he eventually marries. All thus comes right in the end, the old baronet recovering his heir, and the young heroine her lover, and everyone attains the conviction that God is "merciful, not merciless," even the preacher, Mr. Heron, seceding from his gloomy faith. He is led to do this by the knowledge of the evil it produces, and decided by the death of one of his congregants. "I was with her to the last," he says. "I always looked upon her as one of the most religious persons who went to my chapel, but her deathbed was terrible. Up to the last moment of her life she had a dreadful fear that she had committed the 'unpardonable sin'; that she was an outcast from God, predestined by Sovereign Will to be everlastingly lost. To her mind devils were awaiting her last breath, in order to drag her down to hell. Her agony was frightful. This deathbed made me think as I never thought before concerning the effects of our theology, so I decided not to preach it again—at least not the portion of it that relates to everlasting punishment." It is a pity that many a clergyman in real life should not take warning from cases such as these, with which each preacher of this ghastly doctrine must frequently meet. A religion which serves to render a deathbed a scene of horror instead of one of peaceful resignation does not deserve the name of religion—a creed which serves to people our madhouses as this does, and represents the Deity as the most cruel of tyrants, should be banished for ever, and its teaching regarded as a crime.

The Silence of Dean Maitland. By MAXWELL GRAY. (Kegan Paul, Trench & Co.)—The gap among novelists of the first rank caused by the death of George Eliot remains unfilled. A few promising candidates are in the field, but as yet their works have not justified their election, and they have now to face the imminent risk of being passed by the authoress (for surely only a woman could have written it) of this powerful and pathetic story. If the high level which it reaches at a bound is maintained, and its success does not tempt Maxwell Gray to "walk into the parlour" of the publisher with any less matured work, her high place is assured. Never, in our judgment, have the refined and illiterate, yet shrewd, types of English rural life been more skilfully depicted; there is not a lay figure in any of the characters the tragedies of whose lives compose this drama, and we take reluctant leave of them as of men and women known in the flesh. For vivid and delicate description we can recall nothing of its kind which excels, and

XUM

little that equals, the scene in the opening chapter, when Alma Lee, leaning wearily on the gate and watching the waning of the grey afternoon, hears the music rung out from the tiny bells that tinkle on the nodding heads of Farmer Long's team as it drags the massive waggon up-hill. What shame and sorrow the on-coming days brought her; what blight fell on innocent lives, killing high ideals, through the silence which Dean Maitland broke only when the wrong done was irreparable, our readers must learn for themselves. Ingenious as is the plot, and unflagging as it is in interest, the book is not to be read for that alone, but also for its charm of presentment and wholesomeness of tone.

The Life and Labours of John Mercer, F.R.S., F.C.S. By EDWARD A. PARNELL, F.C.S. (London: Longmans, Green, & Co. 1886.)—Mr. Parnell has produced a biography absolutely *sui generis*. His book very largely consists of recipes used at the Oakenshaw Calico-printing Works, chapters descriptive of the processes there employed being connected by a slender thread of narrative of a few incidents in the uneventful life of the guiding spirit there. Mercer was undoubtedly a remarkable instance of a self-taught scientific man who rose from the ranks, such eminence as he achieved mainly belonging to the earlier half of the century. This "Life," however, will be chiefly found valuable by those engaged in the occupation which he so successfully followed. By far the most interesting part of it to the general reader appears under the heading of "Thoughts on Mould, and Preparations for the Cholera," whence it seems that as early as 1843 Mercer advanced a germ-theory of disease, of which the current microbe doctrine of Pasteur and Koch is only a development.

Solid Geometry. By PERCIVAL FROST, D.Sc., F.R.S. Third edition. (London: Macmillan & Co. 1886.)—The mathematician will welcome this new edition of the familiar "Treatise on Solid Geometry," of Frost and Wostenholme. In his preface to the second edition Dr. Frost deplored the loss of his coadjutor's aid; but, without in the smallest degree intending to depreciate the value of Mr. Wostenholme's co-operation, we cannot say that the result of Dr. Frost's unaided exertions leaves anything to be desired. For lucidity, exhaustiveness, and thoroughness of exposition, the work in its present form may well challenge comparison with any one extant. We note that Dr. Frost—as it seems to us with a great show of reason—persists in designating the locus for the equation of the second degree (more commonly known as "quadric") as "conicoid." It may suffice to show that the most rigid application to the study of the higher mathematics by no means necessarily crushes out the sense of the humorous if we quote a few words from those in which our author justifies his nomenclature. "I consider," he says, "that the surface of the second degree at present, whatever may be the case in some future development, stands on a platform of its own on account of the services which it has rendered to all departments of mathematical science, and well deserves a distinctive name instead of being recognised only by its number, a mode of designation which, I am informed, a convict feels so acutely. Man might be always called a biped, because besides himself there exists a quadruped, an octopus, and a centipede, but on account of his superiority it is more complimentary to call him by some special name." The book has obviously been very carefully read for the press.

The Chemistry of Wheat, Flour, and Bread. By WILLIAM JAGO, F.C.S., &c. (Brighton, 138 Springfield Road: The Author. 1886.)—Mr. Jago has produced what may fairly be termed an encyclopædia of milling, breadmaking, and baking, which will be found alike useful to the practical baker and the technological chemist, to say nothing of the ordinary consumer who may feel interested in the composition of "the staff of life," and desire to know somewhat of its composition and the method of production, and to be able to detect adulteration in it where it exists. The chemistry of the subject is exhaustively treated, and a full description is given of every baking process at present in use. The analytical portion of the book may be particularly commended. A chapter is given on the moulds and fungoid growths which attack wheat and flour; in fact, nothing of the slightest interest is omitted in connection with the subjects on which the volume treats. Mr. Jago has done his work well.

Cæsar: a Sketch. By J. A. FROUDE. (Longmans.)—Perhaps the most striking parts of this book, the cheaper reprint of which is welcome, are in the earlier chapters, with their parallels between Roman and modern society, especially in the decay of old beliefs, to the outward and visible forms of which a seeming respect is paid. As to the fidelity of the portrait of the great leader which is sketched in Mr. Froude's matchless prose, opinions will differ, as they differ about aught else that he has written, but in lesser degree as the materials for the sketch are imperfect and remote. There can, however, be no diversity of judgment on the skill with which those materials are woven together, nor on the vivid presentment of the man whose character Mr. Froude has, we think, assessed accurately and impartially.

Boy's Own Stories. By ASCOTT R. HOPE. (T. Fisher Unwin.)—Mr. Ascott Hope is one of the few writers of books for boys who has a worthy ideal in fulfilling his vocation. The tone of all his works is refined and wholesome, and he has withal the rare merit of never repeating himself, not only because his own ideas run in no narrow groove, but because he takes pains to go far afield for the materials for his stories. He has, in the present volume, gathered these from both hemispheres, and had the good fortune to unearth some original autobiographies—narratives of peril and adventure, which cannot fail to interest his audience. Diverse as are the sources from which these are gathered, the book has a unity of purpose and subject, and, whilst the opening tale introduces us to tragic scenes from the Reign of Terror, the closing tale is founded on an enthrilling and affecting incident of the later Revolution which Mr. Hope has adapted from a little-known reminiscence of Jules Simon.

We have received the concluding part of Messrs. Hudson and Gosse's superb and exhaustive monograph on the *Rotifera, or Wheel Animalcules* (Longmans); also the current issues of Mr. Teall's *British Petrography*, to which we hope every student of that branch of the science is subscribing; and of Mr. Cole's *Studies in Microscopical Science*, which maintains its high character. Messrs. Cassell send us a *School Bank Manual*, by Agnes Lambert, which is terse and to the point; a new edition of Morell's *Guide to Employment in the Civil Service*, the best book extant as an aid to candidates in choosing a department of the Service and in hints as to success; and a second edition of Miss Buckland's *Story of English Literature*. This is a good introduction to study of the more elaborate works of writers like Professor Morley, and may conduce to the selection of some period of which full knowledge is more instructive than any skimming of so vast a subject can be. But the space given to the older writers has compelled too meagre treatment of the moderns.

Microscopists may be interested in the following:—The whole of the scientific effects of the late Dr. John Matthews, Vice-President of the Quekett Society, will shortly be sold at Stevens's Rooms, King Street, W.C.

Mr. Medland, of the Borough, has designed an ingenious and compact box, which, within the portable compass of 10 inches length and 4 inches width, contains sixteen trays, in the flaps of which 144 slides can be well and safely packed, any slide being easily withdrawn by opening the fall-back side with which the box is fitted. It is made of polished pine, costs *7s. 6d.*, and is the best and cheapest thing of the kind that we have seen.

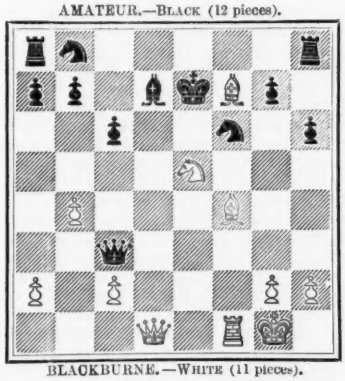
Our Chess Column.

BY "MEPHISTO."

A FEW EXAMPLES OF BLACKBURNE'S SKILL.

GAME-ENDING.

AMATEUR.—BLACK (12 pieces).



BLACKBURNE.—WHITE (11 pieces).

THE following is an ending of a game Mr. Blackburne played at the Manchester Chess Club with an amateur. He gave the odds of the Queen's Rook. We append the moves of the brilliant finish :—

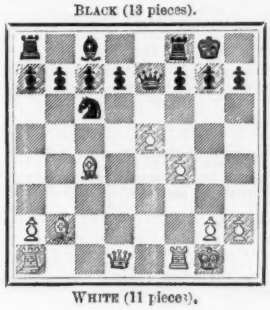
1. B to QKt3	R to K sq.	3. Kt to B7 (ch)	K to K2
2. Q to Q6 (ch)	K × Q	4. B to Q6 mate.	

The following very pretty game is one of eight played blindfolded and simultaneously by Mr. Blackburne at the Manchester Chess Club :—

(Danish Gambit.)

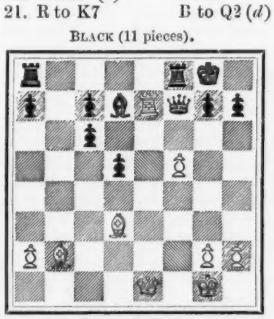
WHITE. Blackburne.	BLACK. C. Brevig.	WHITE. Blackburne.	BLACK. C. Brevig.
1. P to K4	P to K4	14. R to B sq	Kt to R4
2. P to Q4	P × P	15. B to Q3	P to Q4
3. P to QB3	P × P	16. P to B5	P to KB3
4. B to QB4	P × P (*a*)	17. R to K sq	P × P
5. B × P	Kt to KB3	18. R × P	Q to B2
6. Kt to QB3	Kt to B3	19. Q to K sq	Kt to B3
7. Kt to B3	B to Kt5	20. R × Kt (*c*)	P × R
8. Castles	B × Kt (*b*)	21. R to K7	B to Q2 (*d*)
9. B × B	Castles		
10. P to K5	Kt to K5		
11. B to Kt2	Kt to Kt4		
12. Kt × Kt	Q × Kt		
13. P to B4	Q to K2		

BLACK (13 pieces).



WHITE (11 pieces).

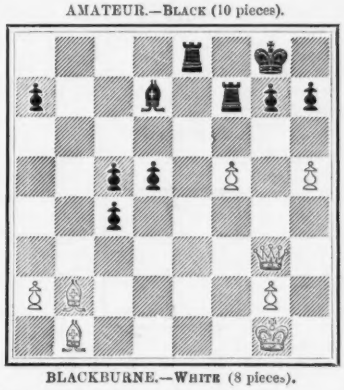
BLACK (11 pieces).



WHITE (9 pieces).

22. R × Q	R × R	27. P to B6 (*f*)	P to Q5
23. Q to Kt3	R to K sq	28. B × P (ch) (*g*)	K × B
24. P to KR4	P to B4	29. Q to Kt6 (ch)	K to Kt sq
25. P to R5 (*e*)	P to B5	30. P to R6	R to K8 (ch)
26. B to Kt sq	P to B4	31. K to R2	B to K3
		32. BP × P, and Black cannot avert mate beyond four more moves.	

AMATEUR.—BLACK (10 pieces).



BLACKBURNE.—WHITE (8 pieces).

NOTES.

(*a*) This constitutes the Danish Gambit. The two White Bishops are very strongly posted. The chief danger lies in White advancing his P to K5, thereby blocking Black's game.

(*b*) Black would not derive any benefit from playing 9. P to Q3 instead of 9. B × Kt, for White would reply with 10. Kt to Q5, in which case Black could not play Kt × Kt on account of 11. P × Kt, followed by 12. Q to R4 (ch), winning a piece.

(*c*) Very cleverly designed, especially if we consider that White must have foreseen some such chance by playing his QR to B sq.

(*d*) Compelled to give up his Queen, as otherwise Black would be mated.

(*e*) Planning a very ingenious attack. Black is vainly endeavouring to cut off the commanding diagonal of White's QB by attempting to fix his P on Q5.

(*f*) Preparing a very pretty combination.

(*g*) Very pretty.

Another blindfold game played on the same occasion :—

(Allgaier-Thorold Gambit.)

WHITE. Blackburne.	BLACK. I. G. Boulaye.	WHITE. Blackburne.	BLACK. I. G. Boulaye.
1. P to K4	P to K4	15. B to Q4	R to B sq.
2. P to KB4	P × P	16. P to R5	Kt to R sq
3. Kt to KB3	P to KKt4	17. B × KtP	P to R4 (*e*)
4. P to KR4	P to Kt5	18. B × B	Q × B (*d*)
5. Kt to Kt5	P to KR3	19. Q to B3	R to R3
6. Kt × P	K × Kt	20. P to Q6 (*e*)	R × P
7. P to Q4	P to Q4	21. Kt × R	P × Kt
8. B × P	P × P	22. QR to Ksq	Q to Q2
9. B to K2 (*a*)	Kt to KB3	23. Q to B5	Q to Q sq
10. Kt to B3	Kt to B3 (*b*)	24. R to B3	R to B2
11. P to Q5	Kt to K2	25. R (B3) to K3	K to Kt sq
12. Castles	Kt to Kt3	26. B × Kt (*f*)	R × B
13. B to K3	B to K2	27. Q to Q5 (ch)	Kt to B2
14. Kt × P	K to Kt2	28. R × B and wins	

(*a*) A change from the usual proceedings; in its favour may be said that it leaves Black's K on the B2, where he is less safe than on Kt2.

(*b*) Here B to Q3 seems better.

(*c*) Played in the vain hope of being able to afford some protection to Kt by R to R3.

(*d*) If, instead of this, R × B, White will win a piece by 18. Q to Kt5 (ch), followed by 19. Kt × Kt &c.

(*e*) There is no answer to this move.

(*f*) Winning a piece.

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WHIST.

By "FIVE OF CLUBS."

THE following game is from the *Westminster Papers*, and was recently selected as a good illustrative hand for the whist column of the *Australasian*:—

THE HANDS.

B { S. (*trumps*).—A, 2, 4, 9. H.—A, 4, 6. C.—Kn, 5, 10. D.—5, 6, 8. }

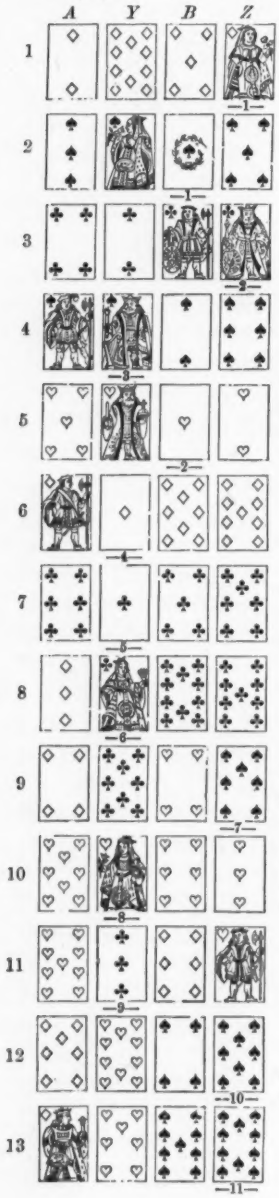
Y { S. (*trs*).—K, Q H.—K, Q, 7, 10. C.—A, Q, 2, 3, 8. D.—A, 10. }

B / Y Z / Tr. S. 7. / A leads.

Z { S.(*trs*).—5,6,7,8,10. H.—Kn, 3, 2. C.—K, 7, 9. D.—Q, 9. }

A { S. (*trumps*).—Kn, 3. H—5, 8, 9. C.—4. 6. D.—K, Kn, 2, 3, 4, 7. }

A B play against *Y* and *Z*. Score:—*A B* three; *Y Z* love.



NOTES ON THE PLAY.

Card underlined wins trick; card underneath leading next.

1. The usual lead now is the fourth best—the so-called American lead. As the cards lie, *Y Z* would have lost nothing had *Z* passed his partner's trick. But he had to play a forward game, the chances being that *A B* were two by honours.

2. The spade six would now be commonly played.

3. Better return his partner's suit.

4. *Y* can now place Spade four and another Spade in *B*'s hand, whose lead at trick 3 spoke plainly of four trumps. Therefore,

7, 8, 9, after making two of his winning Clubs, *Y* goes on with them, leading through *B*'s probable minor Tenace. *B* of course lets the Club pass through a winning card. *Z* must either take this Club or the Three. If he passes both, he will have to take the 11th trick, and *B* will make his Spade nine.

12, 13. *Y Z* wins the game.

MATHEWS ON WHIST.

Our column of Whist strategy from Mathews is crowded out this month.

THE FACE OF THE SKY FOR DECEMBER.

By F.R.A.S.

NEVER more than 15° high even at noon, and shrouded in the mists of winter, the sun now is seen with difficulty, even when visible at all. On the 21st (the shortest day) he is only above the horizon of London for 7h. 44m. The night sky is portrayed in map xii. of "The Stars in their Seasons." Minima of Algol (same map) may be observed at 11h. 15m. P.M. on the 6th; 8h. 5m. P.M. on the 9th; 4h. 54m. P.M. on the 12th; 12h. 58m. P.M. on the 26th, and 9h. 47m. P.M. on the 29th. Mercury is a morning star, and travels to his greatest distance west of the sun (21° 52′) on the 22nd; but he is so badly placed that we may regard him as invisible. Venus, also a morning star, is worse placed still. She comes into superior conjunction with the sun (or is behind him) during the early morning of the 3rd. Mars will be invisible for the observer's purpose during the remainder of the year, a remark which applies equally to Jupiter. Saturn rises between 6 and 7 o'clock in the evening at the beginning of December, and about 20 minutes to 5 on the 31st, so that he is visible during a very large part of the amateur's working night. The slight closing up of his rings will be noted. It is travelling towards δ Geminorum ("The Stars in their Seasons," map ii.). Uranus is invisible; but Neptune may still be seen in the barren region in Taurus to the south and (just to the west) of the Pleiades. The moon enters her first quarter at 2h. 25m. P.M. on the 3rd; is full at 9h. 30·2m. A.M. on the 11th; enters her last quarter at 6h. 39·1 A.M. on the 18th; and is new at 9h. 54·7m. A.M. on the 25th. Several stars will be occulted by the moon during December, but four only of such occultations will happen at convenient hours for the student. On the 3rd h^1 Aquarii, a star of the 5½th magnitude, will disappear at the dark limb of the moon at 5h. 8m. P.M., at an angle from her vertex of 116°. It will reappear at her bright limb at 6h. 30m. P.M., at an angle of 286° from her vertex. On the 10th, B.A.C. 1526, of the 6th magnitude, will disappear at the dark limb at 10h. 29m. P.M., at a vertical angle of 78°; to reappear at the bright limb at 11h. 44m. P.M., at an angle of 292° from the moon's vertex. On the 14th, 54 Cancri, of the 6½th magnitude, will disappear at the bright limb at 9h. 26m. P.M., at an angle from the vertex of the moon of 85°. It will reappear at 10h. 9m. P.M., at the dark limb at an angle of 181° from the vertex. Lastly, on the 28th, 29 Capricorni, a 6th magnitude star, will disappear at the dark limb at 6h. 31m. P.M., at an angle of 159° from the lunar vertex; but the moon will have set ere it reappears at her opposite limb. At noon, on December 1, the moon is on the confines of Capricornus and Aquarius ("The Seasons Pictured," plate xxi.), and is subsequently travelling through Aquarius until 7h. 30m. A.M. on the 4th, when she enters Pisces ("The Seasons Pictured," plate xxii.). In her journey through Pisces, she arrives at 1 P.M. on the 7th at the northern corner of Cetus; by 3 o'clock the next morning she has traversed this and entered Aries. She is in Aries until 6 A.M. on the 9th, when she quits it for Taurus ("The Seasons Pictured," plate xxiii.). As she passes across Taurus she reaches, at 9h. 30m. P.M. on the 11th, the boundary of the northern outlier of Orion. This she crosses in 11 hours, and at 8h. 30m. A.M. on the 12th emerges in Gemini ("The Seasons Pictured," plate xxiv.). She remains in Gemini until 1 A.M. on the 14th, when she quits it for Cancer; leaving Cancer in turn for Leo at noon on the 15th. She occupies until midnight on the 17th in passing over Leo, and, at the hour just named, crosses the boundary into Virgo ("The Seasons Pictured," plate xxv.). It is 1 A.M. on the 21st ere her journey through Virgo is accomplished and she has passed into Libra ("The Seasons Pictured," plate xxvi.). Here she remains until 9 P.M. on the 22nd, when she reaches the narrow northern spike of Scorpio. By 6 o'clock the next morning she has passed through this and entered Ophiuchus. At midnight on the 24th she leaves Ophiuchus for Sagittarius; as she does Sagittarius for Capricornus at 10h. 30m. A.M. on the 27th ("The Seasons Pictured," plate xxi.). At 6h. 30m. P.M. on the 28th she quits Capricornus for Aquarius. She continues in Aquarius until 4 P.M. on the 31st, when she enters Pisces, where she of course remains when these notes terminate.

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